# Motorship

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*EXCLUSIVE technical and non-technical articles on design, construction and operation of oil-engines and motorships by the world's foremost writers on marine engineering.*

# Motorship

*PROFUSELY illustrated with photographic reproductions of the newest designs in international merchant motorship and Diesel-engine construction and auxiliary equipment.*

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# Direct Drive Diesel in Ocean-Going Tug Jumbo

*Maneuvering Is Accomplished Without Effort and Without Errors. After Answering 385 Bells in Quick Succession, the Engineer Is Ready for as Many More. Worth-while Savings Are Effected*

NEVER would it dawn on any uninitiated layman observing the tugboat JUMBO that there is anything out of the ordinary about her except her rapid response to signals. As she noses her way up to the dock she suddenly cuts down headway at the clang of a gong and an instant later slows down almost completely in response to further clamor from the bell. At the same time she begins to kick up a tremendous fuss at her stern, only to nestle softly up to the bulwark while the uproar in the rear subsides obediently at the sound of a concluding jangle.

Getting clear of the dock again after miscellaneous boats and barges have accumulated around her is not so simple and the signal bell in the engine-room hardly stops long enough at any one time for its vibrations to die out. No matter how frequent the sounds, however, each one of them is invariably accompanied by sharp responses at the propeller. Finally the JUMBO gets her shaggy nose clear of the tangle and the sleigh-bell jingle of the "clear" bell has hardly subsided before she is off down the river riding a steep stern swell at the rate of 13½ knots.

Those of us who were accorded the privilege of going on board by the officials of the New London Ship and Engine Company soon began to get acquainted with the propelling machinery of the JUMBO that has given her the precise maneuvering qualities just referred to. She has a single Nelseco Diesel engine which develops 600 b.h.p. in six cylinders at 200 r.p.m. with stroke and bore dimensions of 16½"x24". Chief Engineer Calvin Beebe showed us around.

Since the engine is directly reversible by a simple system, it has been rigidly flanged to the propeller shafting, all clutches or other intermediate driving means being omitted. The JUMBO is therefore the largest and highest-powered direct-drive Diesel tug in the United States.

Her hull was partially completed for the United States Shipping Board and sold to the John W. Sullivan Company of New York City. She was later purchased by the New London Ship and Engine Company, and it is expected that she will shortly be put into the regular service of the Transmarine Corporation. The decision of this firm to adopt the JUMBO rests on the solid foundation of two years' experience with five Nelseco Diesel tugs which they have been continuously and profitably operating on the Hudson River and the New York State Barge Canal.

There is nothing puny about the JUMBO, as is evident from the following hull dimensions:

| | |
|---|---|
| Length | 100 ft. |
| Beam | 26 " |
| Draft, forward | 10 " |
| Draft, aft | 12 " |

She swings a 7-ft. 6-in. bronze wheel, which has a pitch of 5 ft. 9 in.

Owing to the elimination of the boiler, uptake, and coal bunkers, there is plenty of room and to spare in the hull. A crew of nine men are required for 24-hour operation, but sleeping accommodations have been provided for twelve. The absence of coal-dust and ashes makes it easy for the men to keep her invitingly clean and they appeared to be of the type that would naturally take pride in doing so under any circumstances. None of those to whom we talked would willingly swap their jobs for steam-tug berths.


New motor-tug "Jumbo" in the East River, with the skyscrapers of lower New York in the background

All the accessories on the JUMBO, from the Seth Thomas pilot house clock to the Nelseco double-capstan electric hawse-puller on the stern are of the most modern type. Located in the forecastle is an electric steering machine, which is about as simply constructed as any which we have seen, consisting as it does, of an Electro-Dynamic motor geared to the steering chain windlass. Possibly some of the excellent maneuvering qualities of the JUMBO which we saw exhibited is ascribable to the simplicity of the electrical control which is used on this Nelseco steering outfit. From the pilot-house the motor can be started, stopped, and reversed, operations which require only the most rudimentary sort of switches.

Outside of these are limit switches for stopping the motor when the rudder is hard over, but as they operate only at rare intervals, they do not belong to the regular operating equipment. In the pilot-house is a pointer which shows the captain how the rudder is pointing and which he uses to throw one or the other of the switches at the instant when he has given the boat an amount of helm sufficient for his purposes. Most of the time, however, he pays no attention to the pointer since a little practice enables him to judge the amount of helm he is giving by the time intervals at which he operates the switches.

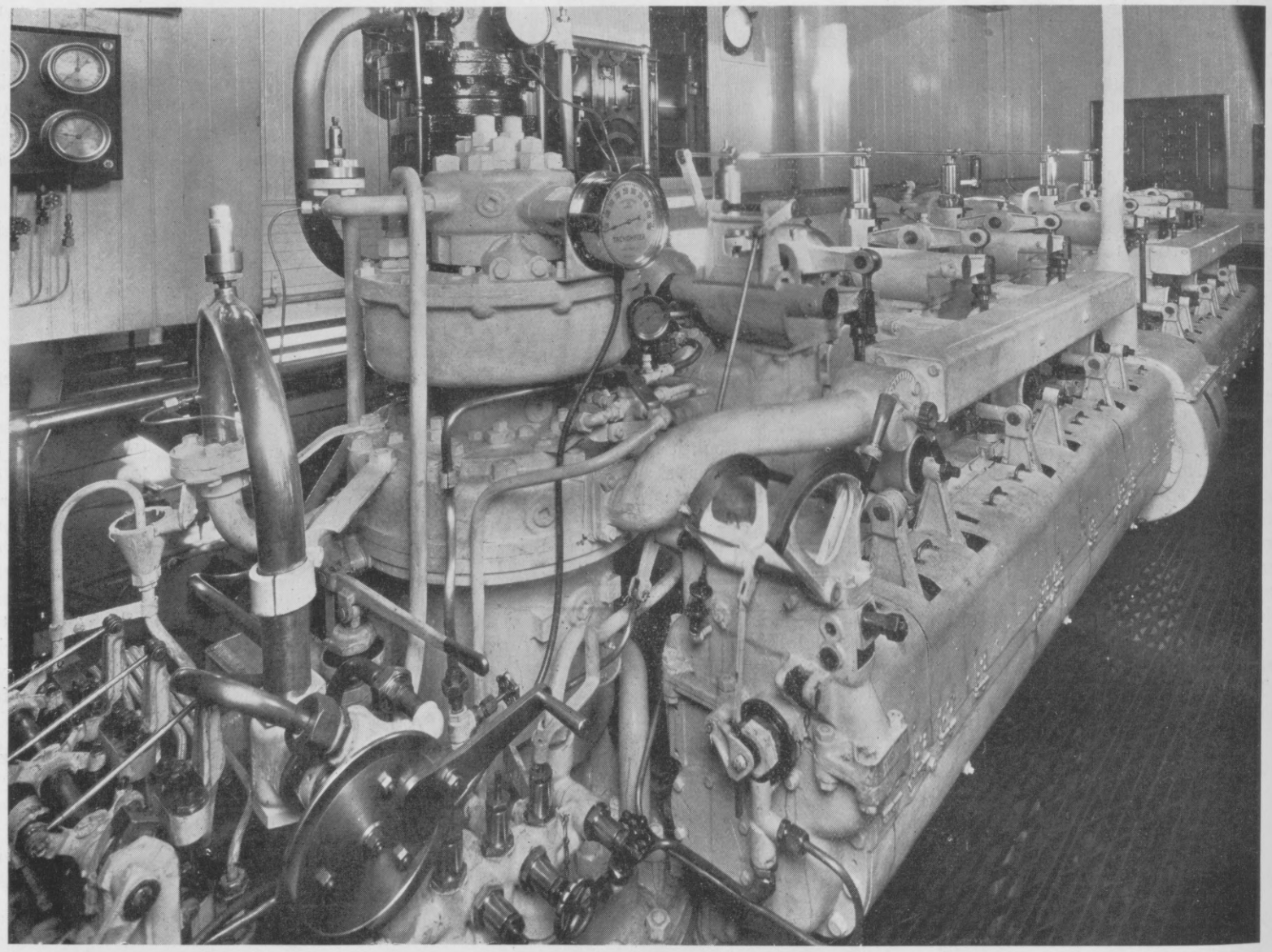
Engine-room auxiliaries make an unusual impression. When we entered, we found everything well lit up with electric lights, but missed the customary purring of a lighting generator. As a matter of fact, auxiliary current is furnished by Exide Ironclad storage batteries as long as the main engine is idle and the batteries float on the line and are charged by a 5-kw. Electro-Dynamic d.c. generator belt-driven from the propeller shaft as soon as a certain speed is attained. Batteries and generator are automatically cut in or out as required by a Ward-Leonard automatic switch located for this purpose on the switchboard. The battery-casing consists of a metal-sheathed box, which is ventilated outboard by a Sturtevant Type-O fan blower.

In case of an emergency current may also be had at short notice from a 7½-b.h.p. Mianus-driven Electro-Dynamic generator, the latter being coupled to the same shaft as a multi-stage Nelseco high-pressure emergency compressor. Since the original try-outs were made there has been no occasion to use this equipment.

An original method of driving the various engine pumps has been chosen. Connected to sprockets on the propeller shaft just aft of the flywheel are four triplex geared plunger-pumps manufactured by the W. & B. Douglas Company of Middletown, Conn. There are four of them driven by silent chains and they consist of a main 3″x4″ fire and bilge pump, a 2″x3″ fuel elevating pump, a 3″x4″ force feed lubricating-oil pump, and a 5″x8″ engine circulating water pump. All of these are duplicated as emergency spares on the starboard side of the engine-room except the circulator and are driven through countershafts by Electro-Dynamic motors. The spare circulating pump consists of a Worthington motor-driven centrifugal.

Lubrication of the main engine cylinders is accomplished by a 12-feed McCord oiler driven from the fuel-pump mechanism. The force-feed oiling system for the rest of the engine is kept free from suspended matter and water by means of a De Laval purifier. Further engine room auxiliaries consist of a Johns-Manville direct-reading tachometer and a Schaeffer & Budenberg steel-tube mercury thermometer for measuring exhaust temperatures.

All the gages, most of which are of Ashcroft manufacture, as well as the speed and temperature meters just referred to are in plain sight of the engineer, who can read the indications of all of them without mov-



**Engine-room of the motor-tug "Jumbo," showing her 600 s.h.p. Nelseco Diesel engine. Note the cleanliness of the engine-room**

ing from his desk next to the throttle. This is an arrangement which ought to find a wide appeal. Speed and exhaust temperature control combined with injection-air, cooling water and lubricating oil pressures give the operator about as complete a means for insuring the safety and good working of his unit as could be imagined. To the inefficient operator it means a ready fixing of responsibility for damage done as the result of his negligence. To the right kind of operating engineer it affords the possibility of always showing that he is on the job, and, what is more, of nipping in the bud any tendencies towards faulty running. A neat and pleasing appearance is imparted to the engine room by the use of "Subway" grating, which also has the property of being firm and rigid while at the same time offering a minimum of obstruction to the passage of light.

One of the features of the engine itself which contributes in a considerable degree to the effortless maneuvering which we have described is the fuel-needle lift-control mechanism, which does not, however, affect the timing of the needle in any way. The device is simplicity itself and we regret not to be able to illustrate it by means of a sectional drawing. An ordinary set-screw behind the end of the needle is turned in more or less in accordance with the needle-travel which is to be secured. An excellent way, it might be said, of breaking something in the needle driving mechanism, were it not for the provision of a stiff, short spring between the fork of the fuel valve lever and the collar on the needle stem. If the needle is prevented from lifting by the set-screw, the short spring merely is compressed without doing any damage. A common actuating device for the screws of all six cylinders is visible in the illustration.

When the engine is running at 100 r.p.m. the time-intervals during which the needles are off their seats are twice as long as at 200 r.p.m., while the number of needle lifts per stroke of the compressor is always the same. At low speeds, too, a full lift of the needle allows too sudden a slamming of the fuel charge into the cylinder and combustion is impeded by an excess of cold injection air. In addition to that wasted air means just that much less air available for starting and maneuvering.

Any one of these considerations by itself has a noticeable effect on the maneuvering qualities of an engine and the combined influence of all of them working together goes a long way towards explaining why the JUMBO can maneuver with all of the facility of a small steam tug.

On one occasion 385 bells were answered in quick succession and only two out of the five available starting bottles had to be drawn upon.

Operating characteristics of tugs like the JUMBO may therefore be taken for granted, but the economic aspects of applying them on a wide scale to all conceivable towing enterprises stand out in even bolder relief. At a cost of coal of $8.00 per ton and five cents a gallon for fuel, comparative costs for a period of 3,000 hours of two 100-ft. tug-boats, one equipped with a Diesel engine and the other with steam would figure out about as follows:

| | *Diesel* | *Steam* |
|---|---|---|
| Engine, H. P. | 600 | 600 |
| Fuel | $6,000.00 | $24,000.00 |
| Firemen (2) | .... | 2,400.00 |
| Lubricating Oil | 600.00 | 300.00 |
| Total | $6,600.00 | $26,700.00 |
| Saving due to Diesel Engine | | $20,100.00 |

# Tanker Propulsion and Diesel-Electric Drive

*How This Form of Propulsion in S. O. Co.'s New Bulk-Oil Carrier J. H. SENIOR Makes Possible Pilot-House Control of Machinery and Simplifies Navigation on Rivers and Harbors*

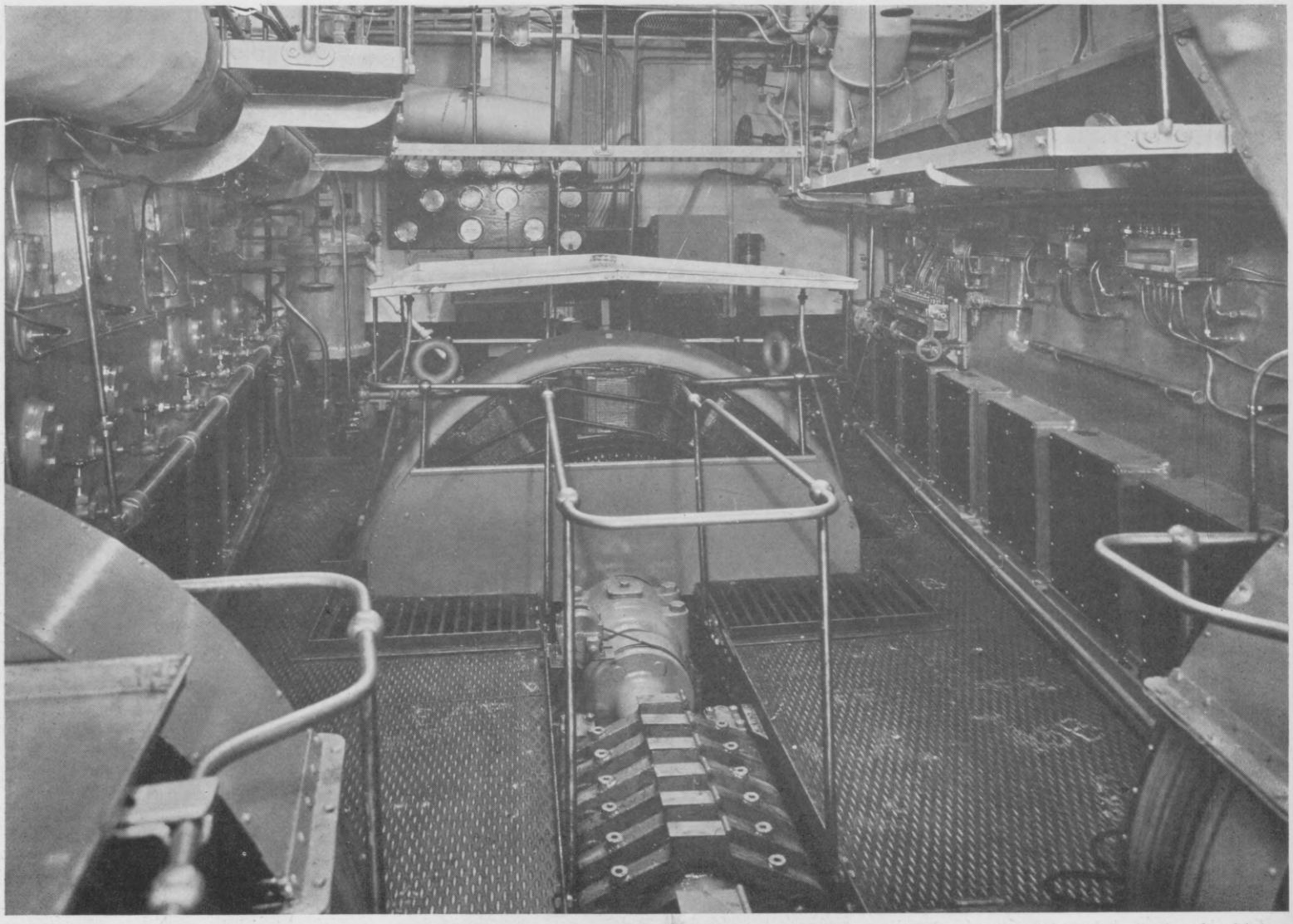
DIESEL-ELECTRIC drive has again been demonstrated in one of its phases by its application to the newly-commissioned tanker J. H. SENIOR, owned and operated by the Standard Oil Company of New Jersey and briefly referred to on page 110 of our February issue. What can be done by the employment of electric drive manifested itself when the SENIOR was still in the first stages of design, and its effect on the engine-room will always be one of the operating features of the ship. Owing to the fact that oil-engined generating units do not have to be in line with anything or parallel to anything, they can be placed exactly in those positions where they can be operated best. What is more, they can be placed far aft in spite of the narrowing lines of the hull with the result that the forward engine-room bulkhead can be located correspondingly farther aft and the carrying capacity of the vessel substantially increased.

Electric generating and transmission equipment for the SENIOR has been furnished by the Westinghouse Electric and Manufacturing Company, while the main prime movers consist of McIntosh & Seymour Diesel engines. Although this electrical and power machinery takes care of all auxiliary loads while the vessel is standing by or under way, a Fairbanks-Morse oil-engine and generator supplies auxiliary current while the vessel is laying to.

Located between the two Diesel engines is the propelling motor, which delivers 455 b.h.p. at 100 r.p.m. Little need be added to the volumes of material that have already been published showing the advantages that are to be gained from keeping propeller speeds low, although there are certain refinements of propeller design which permit the attainment of good efficiencies at relatively high speeds. Immediately aft of the generator is located the horseshoe thrust-block, which occupies exactly the same place as it would in any corresponding single-screw job. It is the combined length of the thrust-bearing and motor which determines the farthest-aft location of the forward engine-room bulkhead. It is interesting to compare this with what it would have been if, instead of an electric motor, any form of direct drive had been placed ahead of the thrust block in this particular boat, the exact distance from the bulkhead to the stem frame being 24 frame spaces, part of which is almost useless in many vessels, the actual machinery space being 40 feet.

For the sake of securing roominess and good operating conditions on the SENIOR, full advantage has not been taken of the


**Broadside view of the Standard Oil Company's tanker "J. H. Senior." She is equipped with Diesel-electric drive and electric power is used throughout for all auxiliary services**



Diesel-electric engine-room of the "J. H. Senior." On either side are Diesel engines direct-connected to generators, both of which supply current to the single motor shown attached to the propeller shaft in the center

opportunity thus afforded of shortening the engine room. Structurally it could easily have been done by employing a short-thrust bearing, say of the Gibbs or Kingsbury type, and by placing the engine foundation higher and further aft. Even so, the space actually taken up by the engine-room is substantially less than what it would have been had any kind of rigid transmission propelling machinery been installed.

Each of the two McIntosh & Seymour Diesel oil-engines develops 350 b.h.p. in six cylinders having bore and stroke dimensions of 13″ x 18″ and turning over at 275 r.p.m. Each one is direct-connected to a 185-kw. Westinghouse generator, to which is also flanged a 35-kw. self-excited auxiliary generator. Both the main generators as well as the propelling motor have no excitation of their own, their field magnetization being under accurate control from the constant-voltage mains of the aforementioned direct-connected auxiliary generators.

In thinking of electric speed-controls, the thing which most readily suggests itself is the resistance-type of controller of the

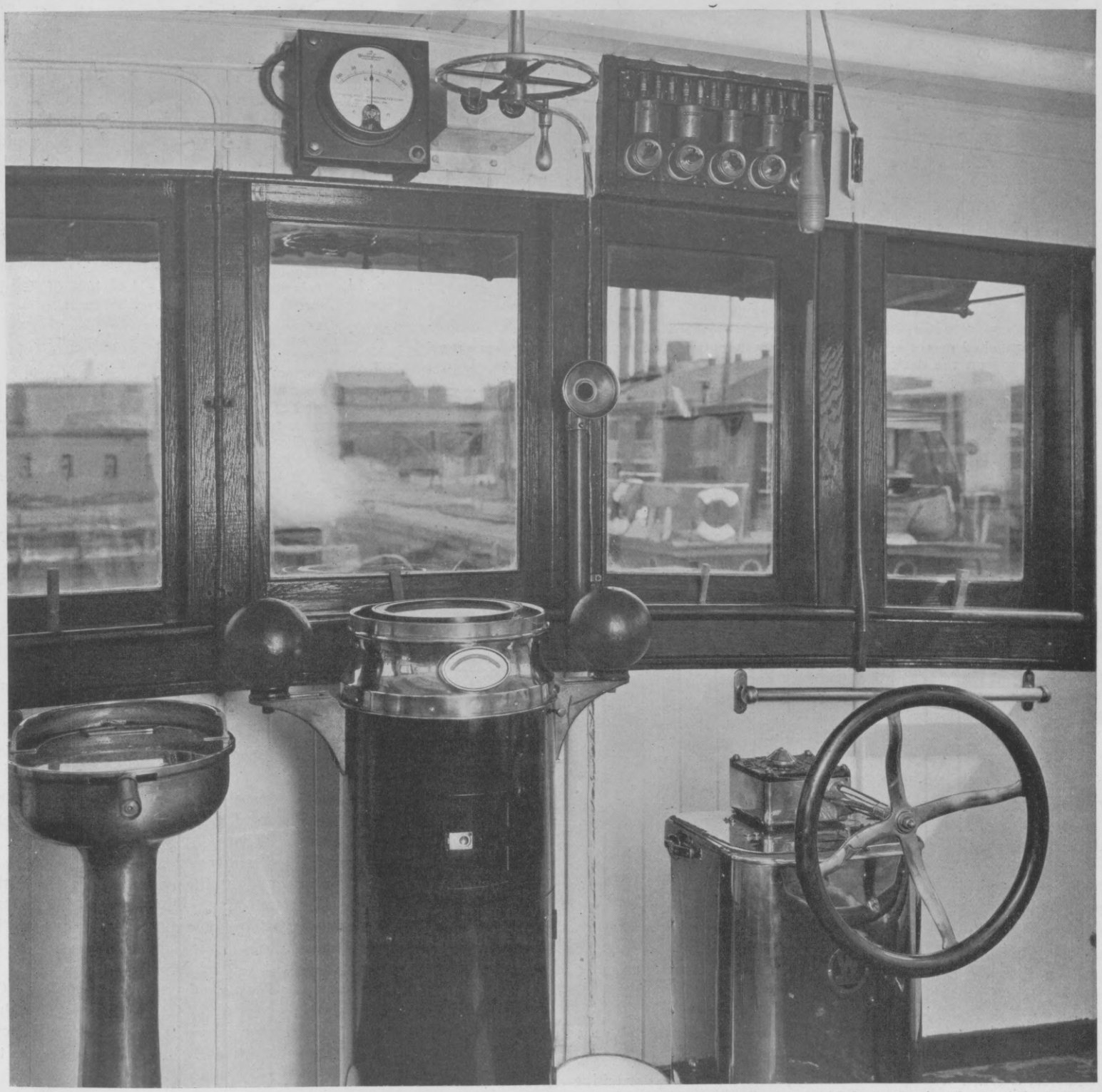

Maneuvering tests of the "J. H. Senior," showing her in the act of going astern. She is especially fitted to operate in the interior waterways of the Delaware River and its tributaries

familiar trolley car, but that method is far too crude and uneconomical to permit of its use on motorships. Speed variation which is accomplished by placing resistance in series with the main line current is wasteful because the heat liberated is a dead loss.

A much neater method consists in varying the strength of the generator field, a process which involves only trifling losses. Owing to the fact that the field current of a generator is only a small fraction of the main line current, correspondingly smaller losses are entailed when it is weakened. Voltage at the terminals can be conveniently varied by this method and as this is also what controls the speed of the driving motor, the simplicity of the procedure is at once apparent. It was originated by the Ward-Leonard Company and is generally referred to as the Ward-Leonard System.

It is obvious, also, that the switches and electrical gear necessary for controlling a relatively small field current are bound to be less complex and costly than it would be if main-line current had to be handled. It is chiefly because of this fact that the pilot-house controller built and installed by the Westinghouse Company could be so compactly designed and was able to impart the precise and effortless maneuvering qualities of which we witnessed a demonstration. The drum-type of controller stationed in the pilot-house could be thrown from full-speed ahead to full-speed astern in one continuous movement without pausing at the stop position. The response on the part of the ship was more nearly instantaneous than anything which has thus far come under our observation.

As observed in the engine-room, the performance of the electrical control system was equally ideal. Before the ship got under way, the Diesel engines were running and were carrying only a small auxiliary load, which, incidentally, is fed with current from the direct-connected exciters. They are larger than is necessary for purely excitation purposes and can more than take care of the lighting, pumps, steering gear, windlasses, heaters, and the like. While



**Bridge-control of propelling motor is a striking feature of electric drive in the "J. H. Senior." At the right is the hand-wheel for operating the worm-geared controller by means of which the field strength of the Diesel-generators can be varied, reversed, and cut out, all by a simple turn of the wheel. In the center is a binnacle-type magnetic compass, and at the left the telelectric steering gear. Overhead is an electric speedometer for the propeller shaft and to the right is a panel of pilot lights for the main circuit-breakers**

**A distinguished group of engineers, shipowners, and company representatives assembled on the deck of the "J. H. Senior" ready to go for a trial run**

the ship is loading or discharging and there is no demand from the propelling machinery for excitation current, these generators furnish power to three 375-g.p.m. cargo pumps manufactured by the Northern Fire Apparatus Company direct-driven by Westinghouse motors. While we were noting these facts in the engine-room and were waiting for something to happen, we casually observed that the propeller shaft had begun to turn and at the same time, by listening sharply, we could detect heavier firing in the exhausts from the Diesel engines. Outside of that there was little else to indicate that full power ahead was being applied to the ship.

Surely there was nothing in the rhythm of the main engines to show that they were answering a "full-ahead" bell. Even the most uninitiated will notice a slight change in speed, whereas the sound of an enclosed exhaust means nothing to anyone who does not know how to listen for it. So perfect is the regulation of these Diesels that they would take on full load or release it without turning a hair. Owing to the fact that they have six cylinders, they show little vibration in spite of their 275 r.p.m. and the deep box-frames with which they are built and which reach clear up to the cylinder-heads give them additional stability.

But no motorship is any better than its auxiliaries, a truth which some sad experiences with steam auxiliaries has emphasized and which has been accorded further recognition in the type of supplementary apparatus fitted on the Senior. Circulating water is taken care of by a pair of Westinghouse-motor-driven centrifugal pumps soon to be replaced by rotary pumps. Bilge, sanitary, and fuel transfer service is rendered by rotary pumps of the Northern Fire Apparatus Company, all of them being direct-driven by Westinghouse motors.

Long life is assured for the tail shaft because of the fact that the stern frame is bushed with a Goodyear-Cutless rubber bushing. It has a diameter of 9¾" and is 24" long, dimensions which result in a moderate intensity of bearing pressure per square inch. Far greater loads, some as high as 375 lbs. per sq. in. have been borne by rubber bearings in continuous operation. Rubber has hitherto been regarded as anything but an anti-friction material; while water, except in combination with lignum vitae, has not been conspicuous in the past as a lubricant. By combining the opposites, however, there has been produced a low-friction bearing specially adapted for working submerged in fresh or salt water and incapable of being damaged by misalignment, shocks, or sand. There is a great future for this type of bearing.

Richardson-Phenix lubricators driven from the main engine through bevel gearing maintain cylinder and wrist-pin lubrication, and the life of a given batch of lubricating oil is indefinitely prolonged by periodically running it through a No. 300 De Laval centrifugal purifier driven by a ¾-h.p. Diehl electric motor. It is interesting to note that not even the Standard Oil Company has any lubricating oil to waste. For keeping the ship's food supplies in good condition there is a Brunswick-Kroeschell ½-ton ice machine driven by a 2-h.p. Diehl motor. According to the most modern motorship practise, also, the galley range is of the electric type, having been furnished by the Edison Electric Appliance Co. It is convenient to use and makes it possible to keep the galley appetizingly clean, to say nothing of keeping the entire stern of the ship free from ashes and coal dust. Heating of the quarters, too, is done electrically by Westinghouse radiators.

Revolutions of the propeller shaft are counted by means of a McNab pneumatic counter and speed readings can be taken directly by the aid of a "Tetco" electric speedometer. It is wired to a Westinghouse indicating voltmeter located on the main operating panel, on which are mounted also the "American" gages for registering the various pressures whose control is necessary for properly running the engines.

Deck machinery, consisting of an anchor-winch, steering engine, windlasses, and capstans, is furnished by the Allan Cunningham Company and is powered with General Electric motors. Its appearance and operation surely contrast favorably with equivalent steam machinery. The decks are not littered with frayed lagging and a great mess of piping and valves is avoided. Steering of the vessel is accomplished by the aid of a J. E. Hand binnacle compass.

Her dimensions are as follows:

| | |
|---|---|
| Displacement, loaded.... | 2,335 long tons. |
| Displacement, light .... | 760 tons. |
| Cargo capacity of holds (about 1,500 tons)... | 11,496 bbls. of 50 gal. ea. |
| Capacity of forehold.... | 7,800 cu. ft. |
| Fuel capacity ..... | 160 bbls. of 50 gal. ea. |
| Deadweight capacity ... | 1,575 long tons. |
| Power of twin Diesel engines ..... | 350 b.h.p. each. |
| Power at propeller..... | 455 s.h.p. |
| Speed of ship..... | 8½ knots. |
| Engine speed ..... | 275 r.p.m. |
| Propeller speed ..... | 100 r.p.m. |
| Propeller dimensions..... | 10′x10′x26′9″ projected area of 4 blades. |
| Length of machinery space (aft) ..... | 40′ |
| Block co-ef. of hull..... | 0.792 |
| Length o.a. ..... | 220′2″ |
| Length b.p. ..... | 210′0″ |
| Breadth moulded ..... | 38′0″ |
| Depth moulded ..... | 16′6″ |
| Loaded draught, mean... | 13′0″ |
| Owners of ship..... | Standard Oil Co. of N. J. |
| Builders of hull..... | Newport News S. B. & D. D. Co. |
| Builders of engine..... | McIntosh & Seymour. |
| Mfrs. of electrical machinery ..... | Westinghouse Elec. & Mfg. Co. |
| Type of Diesel engines.. | Twin 6-cyl., 13″x14″ 4-cycle. |

This vessel is not the first tanker owned by Standard Oil interests to have Diesel-electric drive, as the Standard Oil Co. of California have one vessel in service of approximately the same size, and another now completing. The first of these vessels has given most excellent results and has had quite a little influence in causing the Standard Oil of New Jersey to order the vessel which we have just described. Operation of the J. H. Senior in neighborhood waterways will be watched with considerable interest by shipowners on this coast.

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By a vote of 270 to 29 the U. S. House of Representatives approved of the Greene Bill which enables the Shipping Board to use $25,000,000 for conversion of fifty steamers to Diesel power and enables the Loan Fund to be used for conversions by private American shipowners. The Loan Fund now amounts to about $66,000,000. All told $120,000,000 can be made available. It is expected that the Senate will promptly take similar action to the House.

# Double-Acting Diesel of Unique Design

*How the North British 2,000 s.h.p. Unit Differs from All Other Two-Cycle Double-Acting Marine Oil Engines*

NOTHING, apparently, seems capable of holding up the swift progress which the large-unit marine oil-engine is making. In our last issue we concluded the description of an historical machine of mammoth dimensions built and tested during the World War, and at the same time we gave a fully-illustrated account of a large two-cycle Diesel engine developed and built in America for use on American ships. No sooner has this come off the press than we feel we must find space for a machine of almost equal capacity intended by its very characteristics to be built practically in passenger-liner sizes which has been developed on the other side of the ocean. The North British Diesel Engine Works on the Clyde has built a 2,000-b.h.p. double-acting two-cycle marine engine for a new motorship to the order of Harris & Dixon, Ltd., and is building a set for Furness Withy. We visited the plant last year.

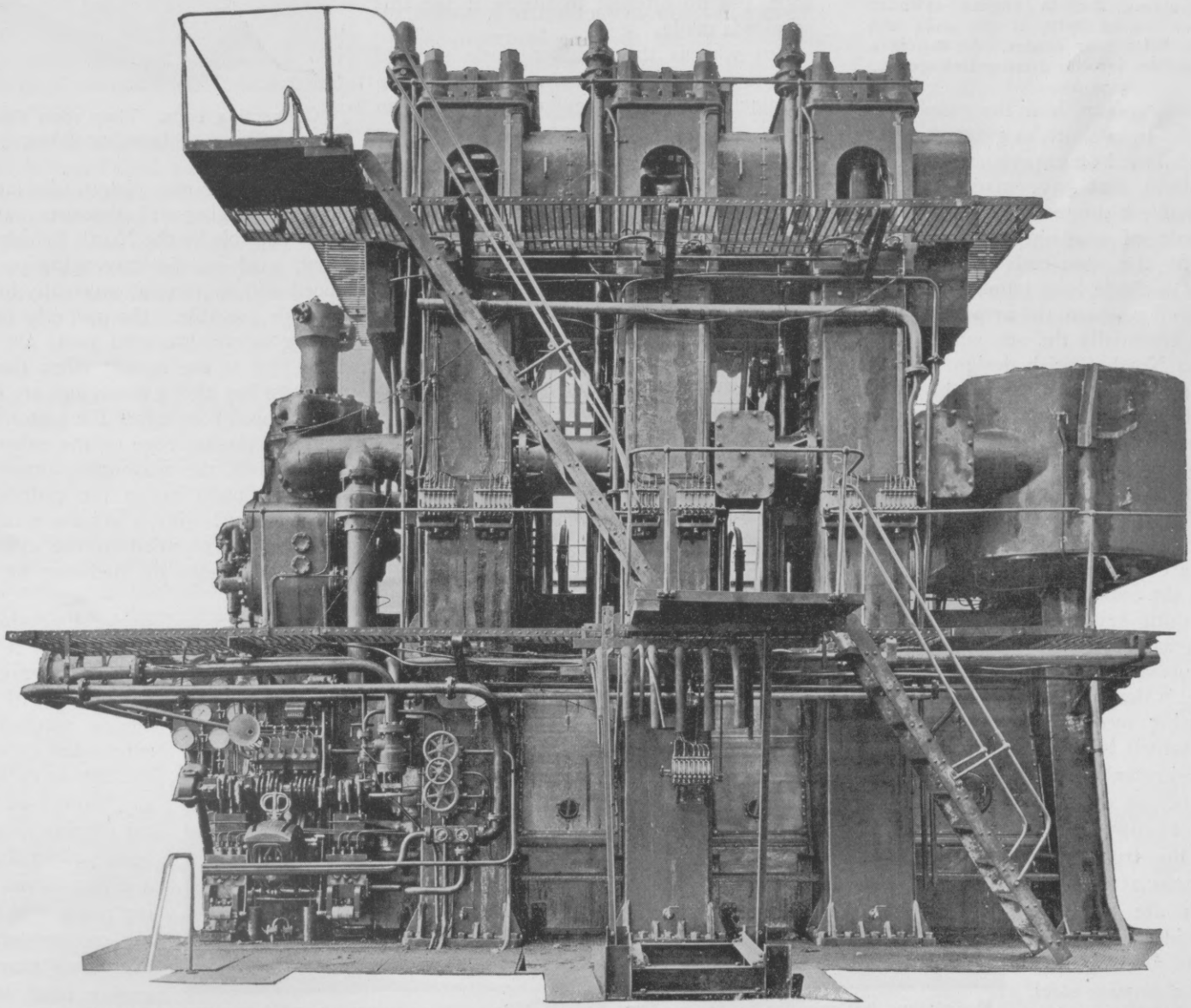
As a well-established builder of four-cycle single-acting engines, this firm has been able to determine definitely what the limiting sizes of their design are. Going over to the two-cycle single-acting principle would have increased the power of a given unit by approximatey 70 per cent, but even at that large bores and strokes with corresponding cylinder-wall thicknesses would have had to be employed in order to obtain really large powers.

It would appear difficult to question the logic of going the full length of combining the two-cycle method of operation with the complete utilization of all the strokes made by a given piston, such as is a commonplace in every steam engine. Two-cycle double-acting engines are, in fact, nothing new, as must be apparent to anyone who has followed our tabulations and descriptions of them in these pages. The engine mentioned at the beginning of this article was one of them, tne propelling unit of the motorship FRITZ, built before the war by Blohm & Voss of Hamburg was another, and experimental stationary single-cylinder machines of 1,000 b.h.p. have been built by Krupp's and by Sulzer Brothers of Switzerland, and smaller units by three American concerns.

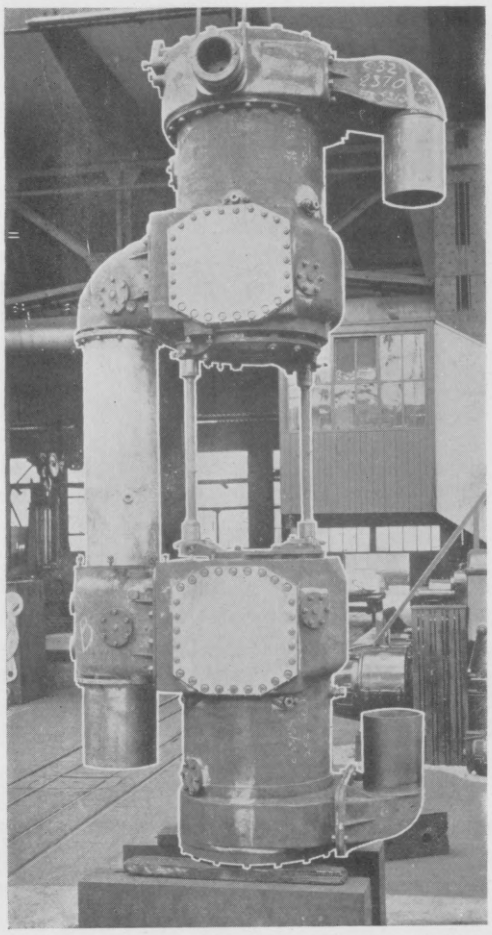
Everyone of these had a stuffing-box, a member to whose elimination the North British Company attach importance. A gland suitable for long-continued use against the normal pressures and temperatures of the Diesel cycle must naturally be of the metallic type. It is water cooled, and that end of it which is located next to the combustion space has no rings, consisting merely of a water-cooled sleeve. The purposes of this is to force the gases to flow along the rod in a thin sheet and thereby to be lowered in temperature before coming in contact with the sealing rings of the gland.

Another member which is avoided in the North British design is the piston rod, the cooling of which and the protection of whose polished surface are considered troublesome. The elimination of valves, too, is an inherent property of this double-acting Diesel engine.

How the engine works double-acting is obvious enough from the cross sections, but a little reflection is necessary to understand the valve events, to visualize how the machine goes together, to show why a sliding



The North British double-acting two-cycle engine has a conventional exterior. Sliding cylinders suggesting the sleeve-valve Knight motor are used and the movable inlet-air elbows fastened to them are visible through the apertures in the upper ends of the main frames



Double-acting 2-cycle engine cylinder with scavenging belts at the ends and exhaust belts near center. At top is a trunnion for the driving linkage

cylinder was chosen, how the gases are led to and from it, in short, to grasp the underlying ideas based on experience and design considerations that have made the North British engine a unique product.

If a pair of single-acting cylinders be placed with the open ends facing one another and a single long trunk be placed to work in both of them, the arrangement that results is essentially the one which characterizes the North British design. Remembering that the two-cycle method of operation has been chosen, it will be seen that a movement of the trunk in either direction will cause compression in either one or the other of the two-cylinder-ends, from which it is readily apparent that the device is double acting. A steam-engine piston, too, will cause compression either in the head-end or in the crank-end of the cylinder, the essential thing being that each of the back-and-forth movements is accompanied by a working pressure process. The next thing, of course, is the method of transmitting the reciprocating movement of the common trunk to the crank-journals of the crankshaft. A gudgeon thrust transversely through the trunk carries bearings at its ends to which are attached side-rods joined near the crank-pin bearing by means of a massive steel casting, views of which are shown herewith. The steel casting, as will be apparent, straddles not only the end of the cylinder, but also the cast-iron cross-girder on which the cylinder-head rests and to which it transmits the load imposed on it by the gases under pressure. The cross-girder corresponds roughly to the horizontal-bar of an ordinary A-frame.

In the case under consideration the A-frames straddle the crank-pits and allow easy access to the main bearing caps. Their location in this plane makes them naturally well suited for mounting the crosshead, which is of the bar-type and fitted on one side only. The importance of using this kind of a cross-head hinges upon the accommodation of a sliding exhaust-pipe parallel to the cylinder and so close to it that the construction of a crosshead and guide on that same side would not be a simple matter. Why it is necessary to have a crosshead may be wondered by some readers who have observed that the long trunk is of itself an effective guiding means. In the original designs (see drawing) such an arrangement may have been contemplated owing to the fact that there the two cylinders are joined into one and have slots cut in their sides to permit the movement of the piston gudgeons. However, the fact that the cylinder has itself a sliding motion makes it ill-adapted to act as a crosshead slide and no attempt to utilize it for this service is made.

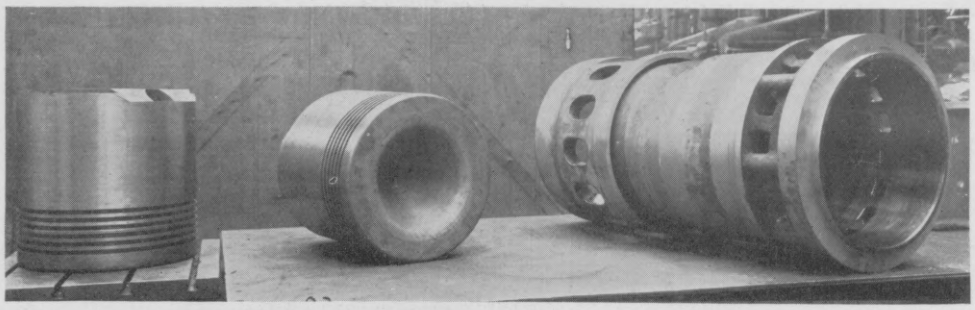
But why is the cylinder made sliding? This is done for the same reason which accounts for the use of cylindrical sleeves in the Knight gasoline engine. A movable cylinder liner with ports and working on stationary heads equipped with piston rings makes an effective valve arrangement giving large areas and quick openings and closings. Owing to the side-connecting rods already mentioned and the space which must be left clear for them to move in, the accommodation of any valve gear other than that of the sliding sleeve would not offer any advantages. Even port scavenging, which requires an inlet belt as well as an exhaust belt, would be hard to squeeze in between the A-frames, side-rods and cross-head guides. The moving cylinder not only solves the air-admission problem, but gives good scavenging. Since the air enters the cylinder at one end and has a clear sweep through to the exhaust ports, all the advantages of uniflow scavenging are secured.

Contamination of the fresh air-charge is minimized to an extent which cannot be so readily realized in any other construction


Connecting rods. They span the crank ends of the double-acting sliding cylinders

except the opposite piston. Because of the low scavenging-air pressures which are made possible by the North British arrangement, work on the scavenging pump is reduced and running at unusually low speeds is made possible. By properly timing the sliding sleeve, the inlet ports are made to open just at the instant when the exhaust pressure has blown down and are held open for a short time after the piston has covered the closing edge of the exhaust ports. As a result, the scavenging pressure is allowed to build up in the cylinder before compression begins, a greater weight of air is therefore supplied to the cylinder and greater amounts of fuel can be properly consumed.

As the bore and stroke dimensions of the engine are 24½"x44", and as it develops 2,000 b.h.p. at 100 r.p.m. on a brake m.e.p. of 63.7 lbs. per sq. in., the success of the scavenging method appears substantial enough. We do not have before us any figures on mechanical efficiency, which are necessarily influenced by a direct-driven scavenging pump and injection-air compressor. However that may be, the engine must indicate a mean pressure of 90 lbs. per sq. in. or more, a



Not pistons, but cylinder heads are shown at left. The cylinder moves up and down on them and gas-tightness is insured by means of stationary piston-rings snapped into the grooves turned in the cylinder heads

figure which gives testimony of excellent scavenging and supercharging.

A structural feature of considerable importance is the elimination of cylinder heads in the ordinary sense of the word. They are replaced by stationary pistons which are free from casting complications and which transmit the working loads of the engine to the framing in a very direct manner. During the high-pressure part of the cycle the rings on these heads seal off the ports inlet in the moving cylinder, exactly as is done in the Knight engine.

Driving the sliding cylinder is accomplished by means of links and walking beams similar to those which are generally used for air-pump drives. Working pressures in the cylinders produce radial stresses only and therefore impose no sort of load on the driving gear. A pair of inlet nipples, clearly shown in the view of the cylinders are rigidly fastened to the cylinders for the admission of scavenging air and work in light metallic stuffing boxes housed in the A-frame columns on the same side as the bar-crosshead. On the opposite side is a corresponding exhaust tube fastened to and moving with the cylinder, but, owing to the fact that the exhausts from both cylinders are brought together in one duct, only one metallic stuffing-box need be employed. It is hardly necessary to add that all the inlet and exhaust movable joints work against merely nominal pressures and therefore should require no special attention during regular operation.

Such, in brief, are the salient features of the North British Diesel Engine Works design, and it is almost superfluous to add that all of them are logically interrelated to a degree beyond that commonly met with. Starting with the double-acting idea, it was decided to use a double-ended piston, a member which automatically led to the use

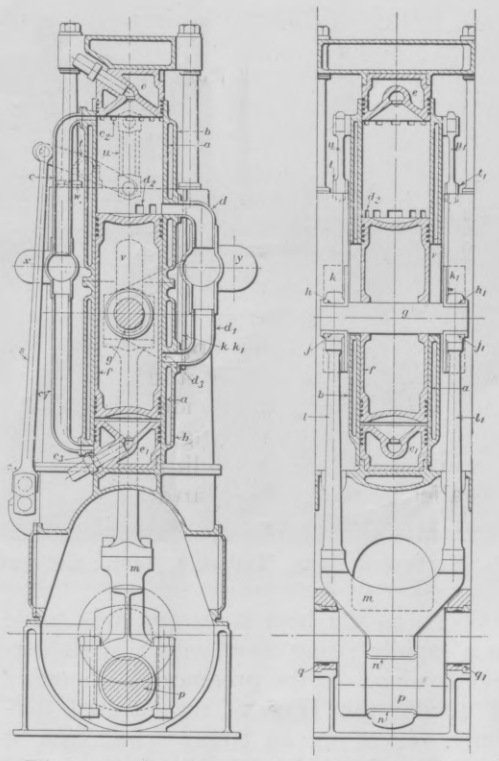


**Diagram showing method of operation of sliding-cylinder engine. In the larger type the cylinder is moved by linkage from the gudgeon-pin**

of the double side rods and the crankpin bearing yoke. A ready and effective means of accommodating an efficient valve mechanism presented itself in the form of the sliding cylinder, a construction which in turn permitted the use of cylinder heads of rudimentary simplicity well adapted for the ready transmission of working loads to the A-frames of the engine. A one-sided cross-head of a kind that was familiar on the earliest steam engines made possible the accommodation of sliding inlet joints on one side and a single slidably-jointed exhaust tube on the other.

This engine has completed successful shop tests and as stated the first unit will be used as the propelling unit for another ship, still to be named, built by Barclay, Curle, & Co. Ltd., to the order of Harris & Dixon, Ltd. Particulars of this vessel are as follows:

| | |
|---|---|
| Displacement, loaded | 12,560 tons |
| Displacement, light | 3,500 " |
| Maximum *net*-cargo capacity exclusive of fuel, water ,and stores | 8,480 " |
| Deadweight capacity (a vague term) | 9,200 " |
| Cubic capacity, 'tween decks | 510,000 cu. ft. |
| Weight capacity, deep tank (oil cargo or fuel) | 875 tons |
| Capacity of double bottom (Diesel fuel) | 700 " |
| Capacity of double bottom (boiler fuel) | 200 " |
| Total fresh water carried | 200 " |
| Length of engine room | 39′ -4½″ |
| Power of main engine | 2,000 s.h.p. |
| Daily fuel-consumption (loaded at sea) | 9¾ tons |
| Port daily fuel consumption | 2 " |
| Daily lubricating oil consumption | 15 gals. |
| Ship's speed loaded | 10½ knots |
| Cruising radius, with deep tank included | 180 days or 45,-300 naut. mi. |
| Weight of main engine | 227 tons |
| Weight of complete engine-room machinery, including propeller, shafting, and all auxiliaries | 515 tons |
| Bore and stroke of main engine (3-cyl. double-acting) | 24½″ x 44″ |
| Speed of main engine | 100 r. p. m. |
| Length of ship, over all | 422′ 0″ |
| Length of ship, between perpendiculars | 410′ 0″ |
| Breadth, moulded | 55′ 3″ |
| Depth, moulded | 29′ 0″ |
| Mean loaded draft | 25′ 4″ |

This ship shows the characteristic benefits that result from the application of Diesel propulsion. It is to be confidently expected that vessels thus equipped will multiply at an ever increasing rate.

# Stern-Wheeler Reduces Fuel-Bill to One-Fourth

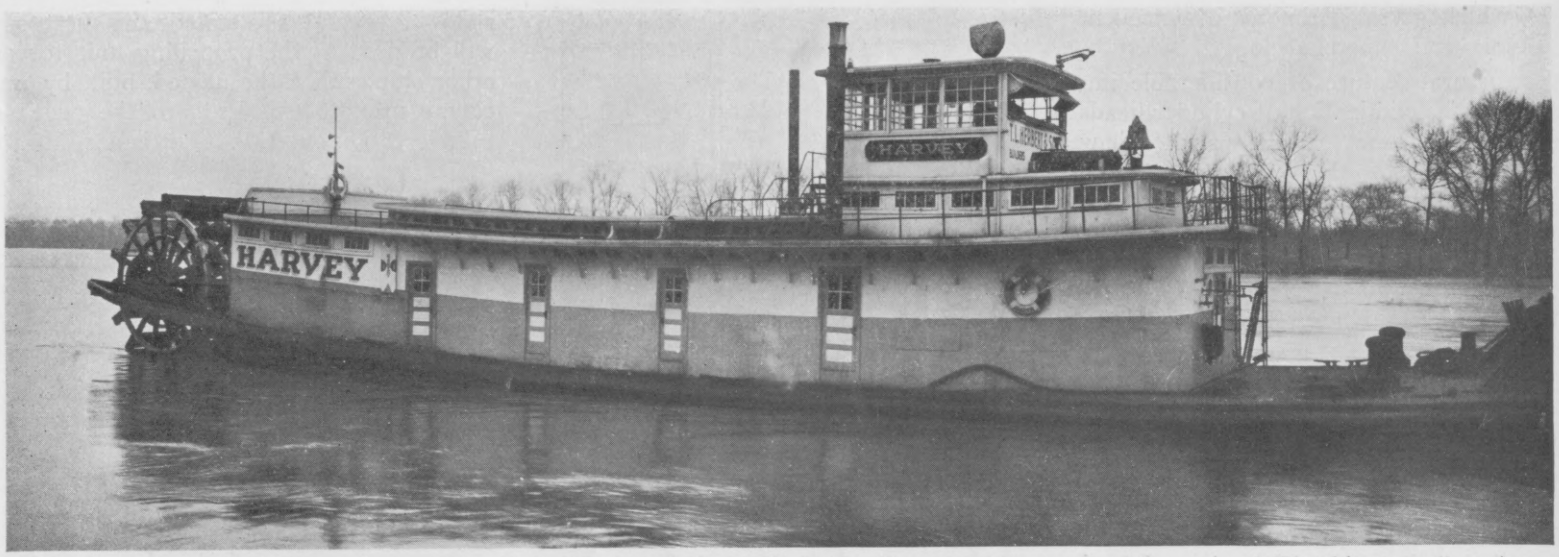
*HARVEY, a 113 ft. Mississippi River Towboat, With Pair of Worthington Oil Engines, Runs Successful Trials*

**Showing method of geared drive to the stern wheel**

ON the Mississippi and Ohio rivers the staunchest of the steam die-hards are slowly but surely warming up to the possibilities of oil-engine power adding to their dividends, or providing profits where little or none have been made for years. Several Diesel and Diesel-electric vessels of this class have been put into operation during the past year on these inland waterways. For almost 100 years, the vessel propelled by a steam paddle-wheel which is rotated by the action of massive wooden connecting-rods (called Pitmans) from long-stroke, single-cylinder, non-condensing engines, has meant reliability to the navigators on our Western rivers. Of an appearance and character distinct from all other craft, Mississippi stern-wheelers have been pictured the world over. They are of a type resultant from the particular conditions of navigation on these shallow rivers with their swift currents.

Reliability rather than economy has been the chief consideration in the construction of our Middle Western river steamers. The possibilities of the machinery stalling and a steamer going over a dam has made owners chary of adopting radically new forms of propelling power such as the clean and quiet oil-burning Diesel engine. Consumptions as high as 8 lbs. of coal per b.h.p. hour are commonly met with in the older craft. It is not surprising that reliability is a vital element, as without such the very vessel itself often may be jeopardized, and the risks of loss be even greater than in the open ocean.

On the Mississippi River and its tributaries, one stern-wheel towboat will assemble and push up or down the stream and around sharp bends, barges covering an area as great as ten acres. The passage through locks compels the division and reassembly of these tows. That is all in the day's work to the efficient pilots of the quaint-looking boats that ply the inland waterways. Where such a high standard of navigation is maintained, it is essential that all bells to



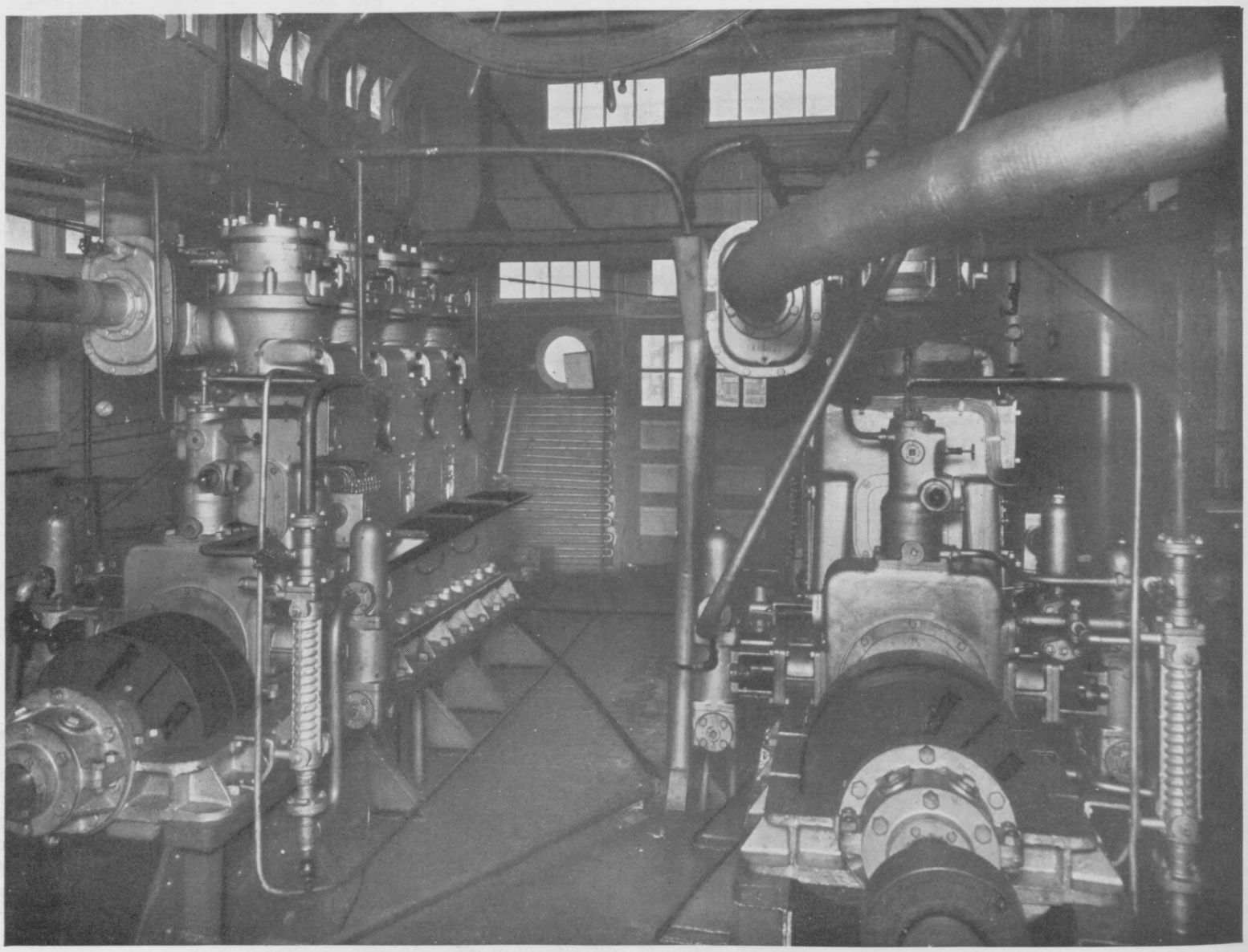

Motor stern-wheeler "Harvey," owned by T. L. Herbert & Sons, Nashville, Tenn., and powered with a pair of Worthington oil-engines

the engine-room be answered accurately and promptly.

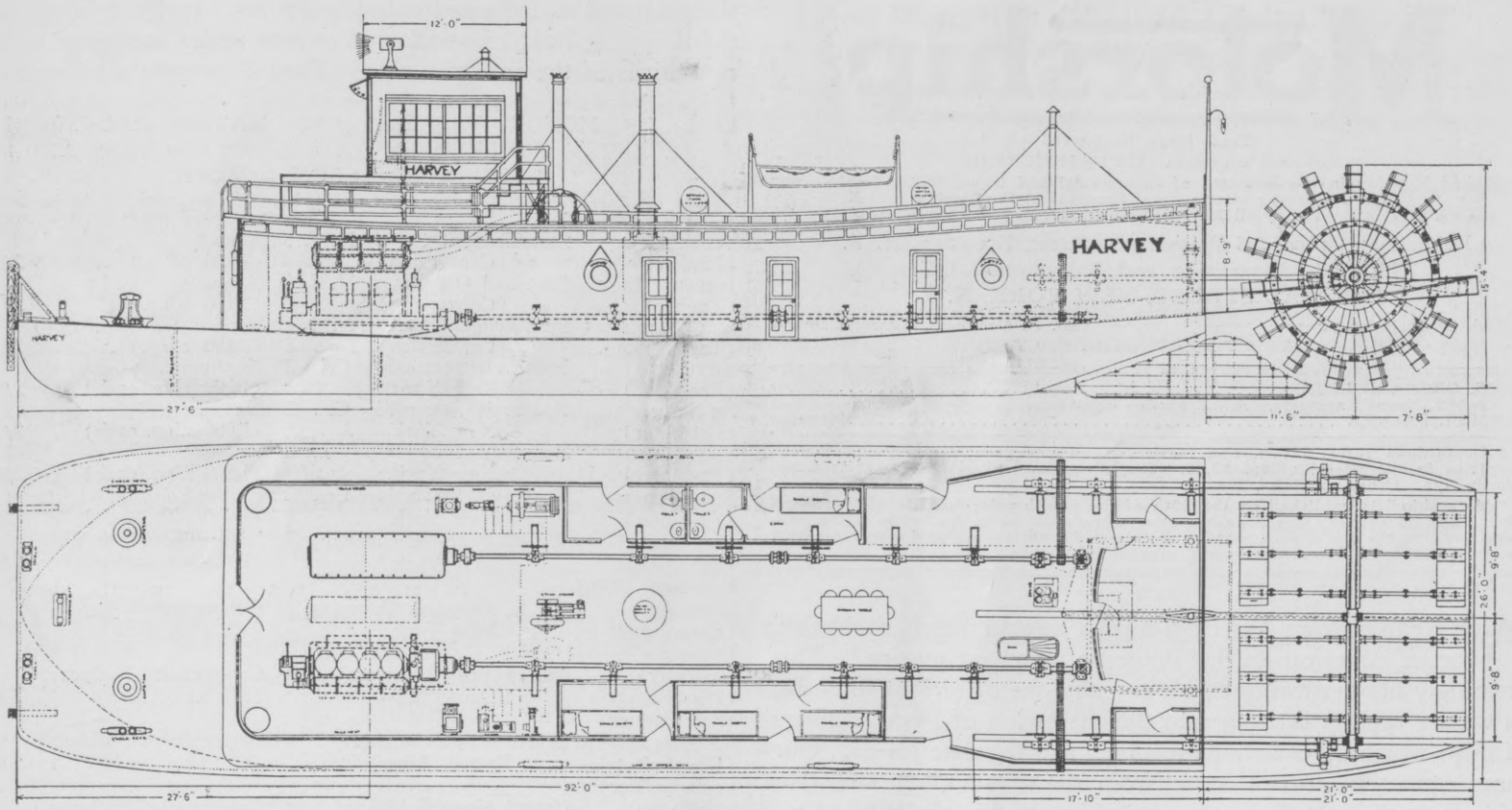
There have been running for half a dozen years on these western rivers some stern-wheelers with old horizontal, non-reversing stationary oil-engines, and lately some modern Diesel-electric vessels have been placed in service. But the credit of owning and designing the first "reversing-at-the-engine" stern-wheel towboat belongs to T. L. Herbert & Sons, sand and gravel contractors of Nashville, Tenn. The recent trial trip of the HARVEY, as the boat is named, was made on a rapidly rising river with a swift current flowing. In the presence of a number of guests, the HARVEY maneuvered perfectly, picked up an empty scow, took it about 14 miles down the river and returned against the current with a loaded tow of sand-barges.

The Herberts and their chief-engineer, W. Harvey Herbert, were enthusiastic over her performance, and no wonder, for they have a steamer of about the same size and power, that from their records, shows a consumption of 7.9 pounds of coal per effective horsepower hour, this as compared with under one-half pound of fuel-oil per horsepower hour used by the Diesel engine. The daily fuel and lubricating oil bill for the steamer is $40 per ten-hour day as compared with $9.50 for the Diesel. These figures are not estimated costs but are from the owner's records.

The Diesel boat shows additional savings in that it requires less operating force and



Engine-room of the stern-wheeler "Harvey," showing the pair of 120 b.h.p. Worthington oil-engines




**Profile and plan of the oil-engined stern-wheeler "Harvey"**

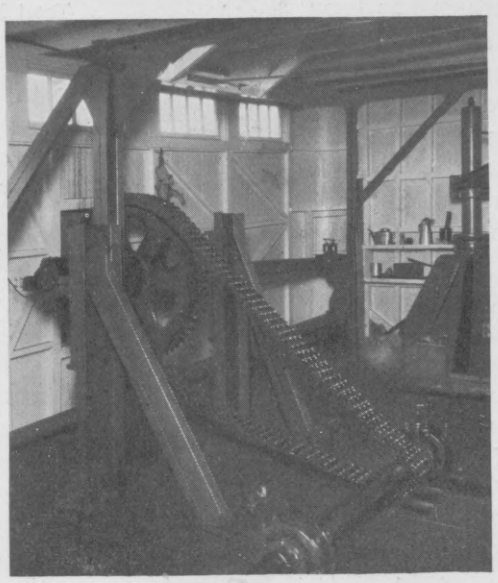
less time for fueling. Specifically, the Diesel has two less in her crew than that in the steamboat, *and there is an approximate saving of* 154 *hours per year in fueling time.* The Company's records show that the steam vessel requires three hours per week as against 30 minutes fueling time every three months for the Diesel. This does not include the attendant savings in labor, cost, delays lost in towing time, and so forth.

The trial of the HARVEY was witnessed by Major Stickney of the Mississippi River Commission, Colonel Dent of the U. S. Engineers Corps, Captain Mitchell of the U. S. Engineers and other prominent engineers and operators from the district.

This vessel, built by the Nashville Bridge Company, Nashville, Tenn., has a steel hull and a complete steel main-deck with a wooden superstructure. Her bow is constructed on model rather than scow lines and she is steered by three balanced rudders 18 feet long. She is 113 feet overall, has a beam of 26 feet and a mean draft of 3 feet. Her speed light in still water is about 12½ miles per hour. Oil-fuel tanks sufficient to operate her for 120 days are located under the engine-room and ballast tanks for trim are fitted forward. The cost of the boat completely equipped was approximately $50,000.

The propelling machinery consists of two Worthington Diesel engines, four-cylinder, two-cycle, airless-injection, direct-reversible, marine type, of 120 horsepower each at 375 revolutions per minute. Line shafts run aft from each engine to a point about 10 feet forward of the stern where a sprocket-wheel, having three teeth abreast, drives a triple-strand two-inch pitch roller-chain. The chain, in turn, through a sprocket-gear, drives a fore and aft outboard shaft at from 74 to 78 revolutions and this shaft, in turn, through bevel gears, operates the stern paddle-wheel at about 19 turns per minute. Sprockets have 13 and 64 teeth. Bevel gears have 17 and 67 teeth. There are no clutches or gear shifts used external to the engines. Such devices are rendered unnecessary by the ease with which the oil engines can be maneuvered.

The paddle-wheel is divided in two parts so that the starboard engine drives the starboard portion and the port engine the port portion. By this arrangement, efficient maneuvering can be accomplished with half the power and also, if necessary, the boat can be operated with one engine. The paddle wheel has a diameter of 15 ft. 4 in. There are 15 buckets, 8 ft. 4 in. long, with a 20 in. face on each wheel. Our illustration of the engine-room shows the clean-looking machinery installation which has been made. Absence of boilers and their heat will be a particular boon to the engineers on the hot summer days.



**Silent-chain drive from the main line shaft to the stern-wheel shaft**

There are some efficient steam installations on Mississippi and Ohio tow-boats; but the old type of non-condensing engines, consuming as high as 8 pounds of coal per horsepower hour, will soon be displaced; in some cases by steam installations comparing somewhere near to the efficiency of land practice, or by more efficient oil-engines. The change may not be as rapid as one could hope, but after twenty or more motorships and motor-tugs are in service demonstrating their worth and economy almost wholesale conversions might take place in a short space of time.

## Late News Notes

FORTHBANK, the fourth of the fleet of nineteen motorships for Andrew Weir's Bank Line, has just been launched by Harland & Wolff.

A 6,000 tons d.w. motorship has been ordered from the Langesund Shipyard, Norway, by the Transatlantic S. S. Co. Götaverken-B. & W. Diesel engines will be installed.

Tests of the first of the three 4,000 i.h.p. Fairfield-Sulzer Diesel engines for the Union Steamship Co.'s passenger motor liner AORANGI have just been made.

Two 800 shaft h.p. Sulzer Diesel engines have been ordered by a Japanese ship-owning company.

The latest British Diesel-driven submarine just commenced, the O1, is said to have a submerged displacement in excess of 4,000 tons.

# Motorship

Trade Mark, Registered


Published Monthly in the Interests of Commercial and Naval Motor Vessels and for Recording International Progress of the Marine Heavy-oil Internal-Combustion Engine

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ARE we to have an American-owned foreign merchant-marine, or an American-owned domestic merchant marine? This seemingly nonsensical question is really one of serious moment, as we are rapidly drifting into the possession of large numbers of ships which other nations will man and regulate for us. Our faces cannot be turned away from the outstanding fact that aside from the vast American capital invested in the White Star and associated British-flag lines of the International Mercantile Marine, motorships and oil-engines exceeding $10,000,000 in value have been ordered from Europe by American concerns within the last eighteen months. These vessels mostly will be run under foreign flags.

Congress has failed to properly support our shipowning interests with sensible laws or subsidies as an alternative. Mismanagement, hesitation, and executive changes in the Shipping Board have reached the position of private owners not knowing whether they are coming or going. The grim shadow of a huge and inefficient war-time fleet still hangs over their heads demoralizing new ship construction in America. Resultant scant orders and heavy overheads of elaborate yards combined with high wages make American shipbuilding costs higher than anywhere in the world. These combined factors are causing domestic shipowners to construct their new vessels in European yards at half the costs and operate them from New York, but under foreign flags.

There are already signs that the Congress recognizes the need for prompt and constructive measures to help American shipowners acquire American motorships. In spite of the welter of investigations and the political seething which has brought our federal legislative machinery almost to a standstill and blocked important legislation like the tax cut bill; the lower house on April 2nd passed the so-called Greene-Edmonds bill creating a $125,000,000 loan fund to encourage the conversion of shipping board vessels to motorships.

The bill amends two sections of the Merchant Marine Act of 1920. One section authorizes the Shipping Board to use funds up to $25,000,000 for the conversion of vessels into motorships. This fund is to be obtained partly from such money as is appropriated for reconditioning and the balance is to come from the present construction loan fund. The conditions under which this money may be used for this purpose are that the Board must have a customer for the ship, the terms of the sale being set forth in the bill, or a term charter for the ship, of not less than five years. Also the Board must place the vessel into actual operation. It is stipulated that the vessels are to be actively engaged in the foreign service.

The bill also amends the construction loan fund provision so as to permit loans for the conversion of ships into motorships as well as for construction purposes. In the original act the Shipping Board was allowed to loan under mortgage up to two-thirds of the cost of a ship. The bill permits a loan of 50 per cent on either ship or the installation of motor and an additional loan up to two-thirds of the cost, providing additional satisfactory security is given, the market value of which is twice the value of the original loan.

LIST OF MOTOR VESSELS AND MARINE OIL-ENGINES RECENTLY ORDERED BY AMERICAN CONCERNS AND INDIVIDUALS FROM EUROPE

| Name of Ship and Type | Owner | No. of Engines | Make of Oil-Engines | Total Brake Horsepower |
|---|---|---|---|---|
| Trontolite (Tanker) | Standard Oil Co. of N. J. (Conversion) | 1 | Krupp (2,150 s.h.p.) | 2,150 |
| Josiah Macy (Tanker) | Standard Oil Co. of N. J. (Conversion) | 1 | Krupp (2,150 s.h.p.) | 2,150 |
| S. B. Harkness (Tanker) | Standard Oil Co. of N. J. (Conversion) | 1 | Krupp (2,150 s.h.p.) | 2,150 |
| Silverelm (Freighter) | Roosevelt Steamship Co., New York. | 2 | Neptune (1,000 s.h.p. each) | 2,000 |
| Silverpine (Freighter) | Roosevelt Steamship Co., New York. | 2 | Neptune (1,000 s.h.p. each) | 2,000 |
| Silverlarch (Freighter) | Roosevelt Steamship Co., New York. | 2 | Neptune (1,000 s.h.p. each) | 2,000 |
| Silvercedar (Freighter) | Roosevelt Steamship Co., New York. | 2 | Neptune (1,000 s.h.p. each) | 2,000 |
| Unnamed (Cargo and Passenger Ship) | W. R. Grace & Company, New York. | 2 | Götaverken-B. & W. (900 s.h.p. each) | 1,800 |
| Unnamed (Cargo and Passenger Ship) | W. R. Grace & Company, New York. | 2 | Götaverken-B. & W. (900 s.h.p. each) | 1,800 |
| La Playa (Diesel-electric Fruit-Carrier) | United Fruit Company, Boston, Mass. | 4 | Cammellaird-Fullagar (825 s.h.p. each) | 3,300 |
| La Perla (Diesel-electric Fruit-Carrier) | United Fruit Company, Boston, Mass. | 4 | Cammellaird-Fullagar (825 s.h.p. each) | 3,300 |
| La Marea (Diesel-electric Fruit-Carrier) | United Fruit Company, Boston, Mass. | 4 | Cammellaird-Fullagar (825 s.h.p. each) | 3,300 |
| Phoebus (Tanker) | Standard Oil Interests | 2 | Sulzer (1,600 s.h.p. each) | 3,200 |
| Prometheus (Tanker) | Standard Oil Interests | 2 | Krupp (1,600 s.h.p. each) | 3,200 |
| Hull 471 (Tanker) | Standard Oil Interests | 2 | Krupp (1,325 s.h.p. each) | 2,650 |
| Hull 470 (Tanker) | Standard Oil Interests | 2 | Krupp (1,325 s.h.p. each) | 2,650 |
| Fordonian (Diesel-Electric Freighter) | McDonnell & Truda, New York. | 2 | Fiat San Giorgio (450 s.h.p. each) | 900 |
| Unnamed (Yacht) | Fredk. Vanderbilt, New York. | 2 | Burmeister & Wain (700 s.h.p. each) | 1,400 |
| Ara (Yacht) | Wm. K. Vanderbilt, New York. | 2 | Polar (825 s.h.p. each) | 1,650 |
| Vanadis (Yacht) | C. K. G. Billings, New York. | 2 | Krupp (900 s.h.p. each) | 1,800 |
| Oceanus (Yacht) | J. W. Kaiser, New York. | 2 | Krupp (350 s.h.p. each) | 700 |
| Hussar (Yacht) | E. F. Hutton, New York. | 1 | Burmeister & Wain (600 s.h.p.) | 600 |
| Ripple (Yacht) | C. M. Leonard, Chicago. | 2 | Krupp (250 s.h.p. each) | 500 |
| Dauntless (Yacht) | W. M. Hanan, New York. | 1 | Krupp (450 s.h.p.) | 450 |
| Moby Dick (Yacht) | F. S. Fish, New York. | 1 | Krupp (180 s.h.p.) | 180 |
| | | Total Number of Engines.. 50 | Total Horsepower .... | 47,830 |

While not perfect, the bill is a step in the right direction. Its efficacy would be greatly increased in our opinion if amended to permit the board to lower the rate of interest to two per cent. It is significant that the bill was supported by Republicans and Democrats alike and passed by the overwhelming vote of 270 to 29.

The solution for this dangerous situation is possible, but it needs not only courage and vision on the part of the Board, but willingness of Congress to do its part promptly. Anything that is done must be done this year, or it will be too late. Repeal the La Follette Act and replace it with practical legislation. Give federal aid to our shipyards with adequate naval and coast-guard construction at prices not pared to the limit. (Let us help our plants—not begrudge reasonable profit.) Take 500

or more of the Shipping Board's inefficient war-relics out to sea and use them as naval targets. Convert 200 of the best passenger and cargo hulls to Diesel power and sell them on easy terms at approximately the cost of conversion, or loan most of the money necessary for conversion purposes to bona fide American shipowners at 2¾ to 3¼ per cent interest for fifteen years, the latter to be in accordance with the proportion put-up by the owners. Also let the Board get out of the ship-operating business without delay. Considering that the chaotic shipping conditions of today all result from wartime necessities and post-war hysteria, there is nothing radical in these six proposals. Immediate action on this policy will go a long way towards providing and maintaining an efficient merchant-marine commensurate with the position of this great nation in the world, and the vastness of its exports and imports. That we are not a sea-minded nation is a bogey inspired by nervous rivals, but disproved by the greatness and efficiency of our splendid navy, and by the country's vast fleet of motorboats and yachts.

## Our Shipyards and Diesel Engine Orders

AS discussed elsewhere, extensive orders have recently gone abroad; but the past year has been a busy one for the leading American oil-engine builders because of the big orders from the stationary field. This does not apply to many of the shipyards which have just taken up Diesel-engine construction and who have been converting ships from steam to oil-engine power mostly on their own account. Some have felt foreign competition very severely. In several cases, it is due partly to their having refrained from securing adequate publicity in this field and assisting to stimulate the market. In contrast, one American marine and stationary oil-engine company has been working three eight-hour shifts per day steadily for three years. Last year its output exceeded 100,000 horsepower and its profits, after liberal deductions for depreciation and reserves, were just under $2,500,000. Sales already made this year are even greater over the same period.

# Interesting Notes and News From Everywhere

*World's Record of New Construction, Ships' Performances and Other Matters of Note in the Motor-Vessel and Oil Engine Industries*

TAIWAN is the name of one of the motorships just launched at the Deutsche Werft for Wilh. Wilhelmsen.

The Todds Shipyard at Mobile has secured the contract for the 65 ft. oil-engined tug from the U. S. Engineers' office.

LIGHTSHIP III. is to have a Diesel engine propelling-set installed by order of the Bureau of Lighthouses, Washington, D.C.

The Albyn Line, Ltd., Sunderland, England, Lord Joicey, Chairman, has ordered a 400 ft. motorship from Harland & Wolff.

Fred Olsen & Co. have just ordered another twin-screw vessel of 2,800 h.p. and about 8,000 tons deadweight from the Akers Mek Verksted.

The motor-liner building at St. Nazaire, France, to the order of the Netherland Steamship Co., will be named PIETER CORNELISZOON HOOFT.

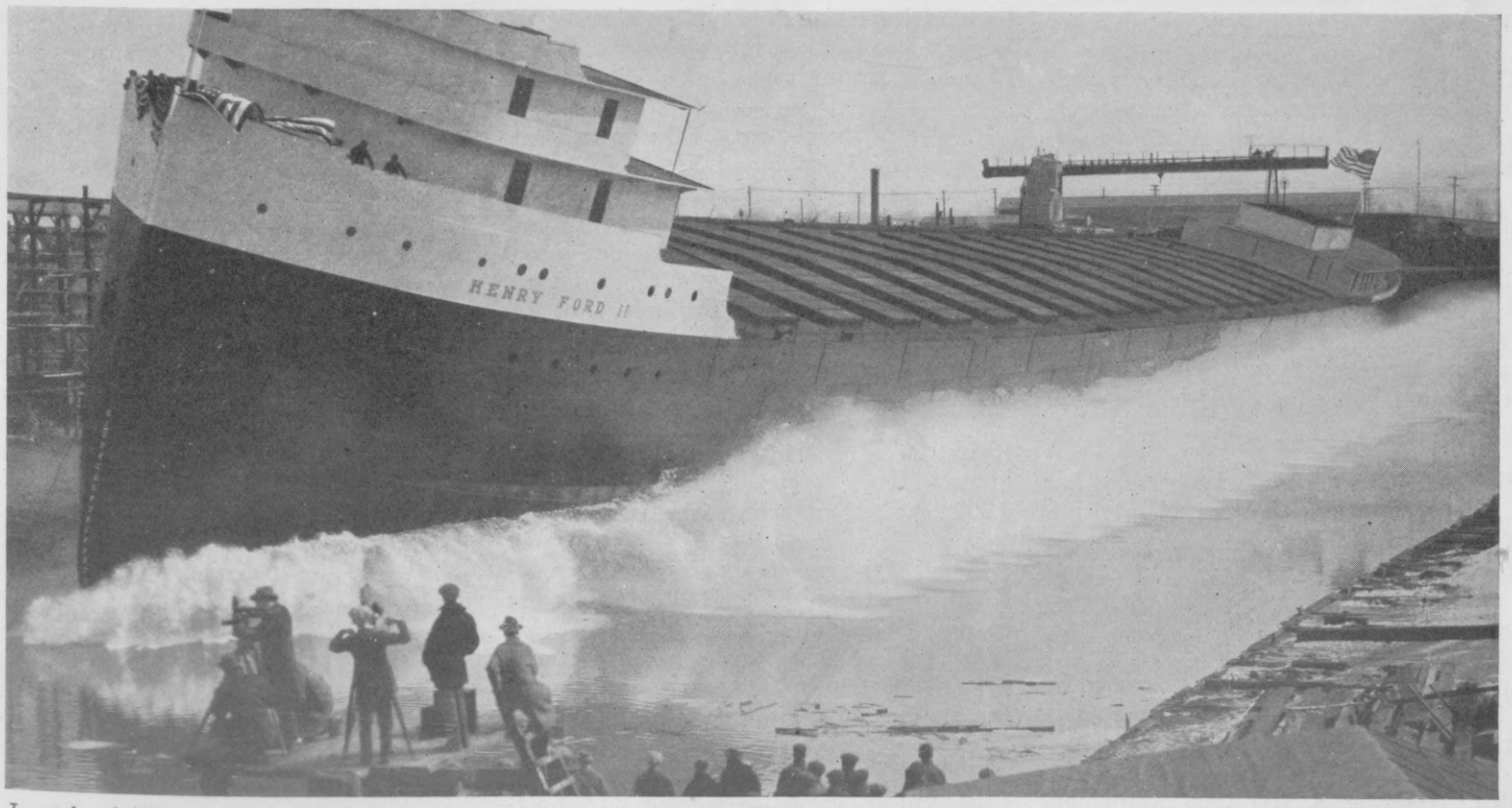
Foettinger transformers will be used in conjunction with a Diesel-engined tug of 500 s.h.p. building by the Bremen-Vulcan in Vegesack, near Bremen.

The motorship SAARLAND was completed on February 2nd at the shipyard of Blohm & Voss in Hamburg. She will be operated by the Hamburg-American line.

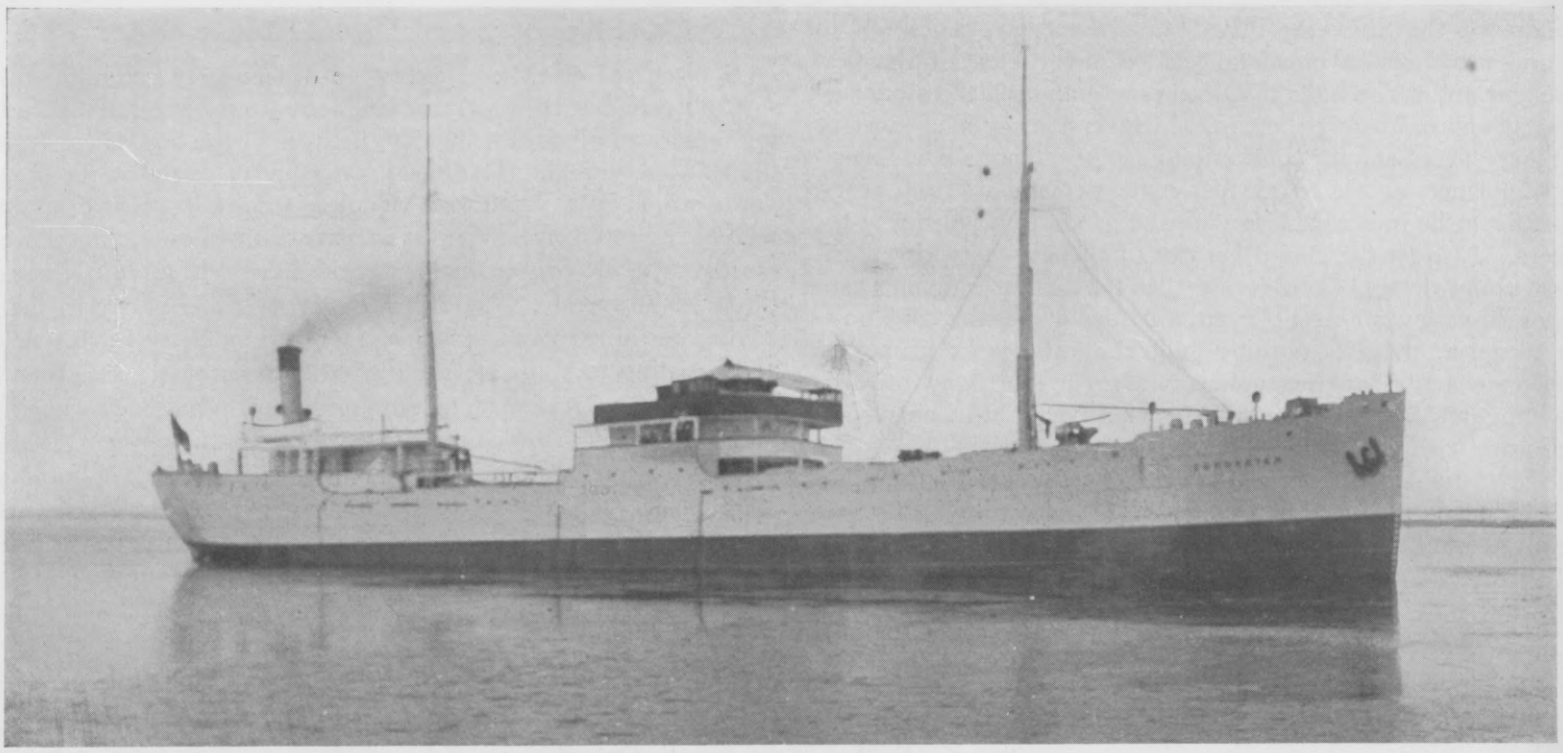
Sir Herbert Samuelson has ordered a 300-ton, 540 s.h.p. oil-engined yacht from Camper & Nicholson, builders of the various SHAMROCKS. Twin 270 s.h.p. Bolinder engines will be fitted.

RIO BRAVO, a combination passenger-cargo motorship for the Hamburg Ocean Line, will shortly run trials. Two 1,500 s.h.p. Krupp Diesels are installed. Length 394′, breadth 52′ 6″, depth 24′ 6″. Speed 13 knots.

Ansaldo San Giorgio, Spezia, recently launched the motorship FALERIA to the




Launch of "Henry Ford II" (one of the two 600-ft. motorships for the Ford Motor Company) at the American Shipbuilding Company's plant on the Great Lakes. A 3,000 s.h.p. Sun-Doxford Diesel engine is being installed



**Shipowners, shipbuilders and naval architects are cordially invited by the owners of the above illustrated motor-tanker "Zoroaster" to visit this ship when she arrives in New York Harbor on her maiden voyage towards the end of April. A single screw 1,600 shaft h.p. Nobel Diesel engine is installed**

order of the Roma Navigation Co., of Rome. She is of 8,400 tons dw. and is equipped with a Fiat Diesel engine.

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Following a connection with the Falk Corp. since its inception, E. A. Wurster has retired from his position as secretary and treasurer owing to ill health. His office is now being filled by Clarence R. Falk.

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The 6,350 tons motorship ordered sometime ago by the Avenir Shipping Co., of Christiania from the Odense Shipyard was recently launched and named GISLA. Twin Burmeister & Wain Diesel engines are installed.

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The Houlder Line, of London, is seriously considering ordering a large refrigerator motorship for its South American service. This is partly due to the influence of Sir Fortescue Flannery, the consulting engineer.

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BRITISH AVIATOR is the name of the tanker being equipped with the six-cylinder 3,000 s.h.p. Palmer-Cammellaird-Fullagar oil engine illustrated in our February issue. She is now building for the British Tanker Company.

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Sir Walter Runciman, who hitherto has not appeared to be in favor of Diesel drive, has ordered two 8,000 tons single-screw motorships from Wm. Doxford & Sons, for the Moor Line. One by one shall they be converted!

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In the 80 ft. tug PROSPERATIVE owned by the B. W. B. Navigation Co., tugboat operators of Vancouver, B. C., a 6-cylinder 225 s.h.p. Winton Diesel engine is being installed, replacing a 160 i.h.p. compound steam engine.

On page 98 of our February issue the deck winch of the SOLITAIRE was referred to as a "hydro-electric windlass" driven by a General Electric motor. Of course it is a Hyde electric deck-winch operated by a Diehl motor.

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Doxfords launched Furness Withy's single-screw 10,000 tons motorship PACIFIC TRADER on February 20th. Her Diesel engine is of 3,400 b.h.p. at 87 r.p.m. Dimensions, 420 ft. by 58 ft. by 30 ft. 11 in. Speed, 12 knots.

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The Ivarans Rederi, Ivar An. Christensen, Manager, has contracted with Burmeister & Wain for two 7,600 tons d.w. Diesel-driven ships to be built to Norwegian Veritas classification, for delivery in 12 and 15 months respectively.

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Twelve of the sixteen 8,000 s.h.p. motorships for the London and King Sound (N. W. Australia) meat carrying service have been ordered from Swan Hunters, Furness Shipbuilding, Palmers Shipbuilding, Vickers, John Brown and Wm. Beardmore, each firm receiving two motorships.

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TRIESTE is the name given to the first of the two 10,000 tons motorships building for the Lloyd Triestino at the Cantiere San Rocco, Trieste. This company will install in each vessel Diesel engines aggregating 3,900 i.h.p. of their own construction.

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Two 1,000 tons motorships have been ordered by the Bergenske S. S. Co., from the Trosvik Shipyard, Bravik, Norway. Polar Diesel engines will be installed. This Company also has a 6,800 tons motorship building at Copenhagen for delivery next July.

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A 10,000 tons Diesel-driven freighter to have Vulcan reduction-gearing and Foettinger hydraulic transformers has been ordered from the Vulcan Shipyard by the German-Australian Steamship Co. She will be a single-screw vessel of 4,000 s,h.p.

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The customs duty imposed by Spain on heavy-oil engines is only one-fourth of the import duty on light fuel engines. Consequently, American manufacturers should take energetic steps to enter the Spanish market. Very few oil engines are actually constructed in Spain.

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In the 300 tons steam yacht LADY OF CLENNELL, owned by Albert Batchelor of Halling, England, a 530 s.h.p. Augsburg submarine engine has been installed in conjunction with electric drive. This gives double the power in the same space as the old steam machinery.

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An 8,000 tons Diesel-driven tankship will shortly be ordered by the Navigazione Generale Italiana from a shipyard at Bara on the Gulf of Naples. The vessel will be built from materials purchased for two steam-driven freighters, the order for which was recently cancelled.

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E. C. Myers will represent the Falk Corp. at 320 Rialto Bldg., San Francisco. At Detroit the Falk Concern has opened offices at 1500 Real Estate Exchange Bldg., with Charles C. Walsh in charge. The activities of these gentlemen cover a wide range in both engineering and selling.

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Burmeister & Wain on February 12th declared a dividend of 15 per cent on their recently increased capital of 15,000,000 kr. The profits for the year were 2,925,548 kr. compared with 1,843,000 kr. in 1922. Burmeister & Wain are constructing motorships and Diesel engines exclusively.

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Simultaneously with the tendency of

American small oil-engine builders to turn from the surface-ignition to the high-pressure airless-injection types, European firms are extensively taking up various forms of the hot-bulb surface-ignition oil engine, generally with cold starting arrangements.

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On page 107 of the February issue of MOTORSHIP was given an illustration of the hydro-electric steering-gear of the motor yacht DELPHINE. It was stated that this was operated by a 3-h.p. Reliance motor, whereas the motor in question was made by the Electro Dynamic Company, of Bayonne, N. J.

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The contract for converting the Standard Oil Co. of New Jersey's three steamships, TRONTOLITE, JOSIAH MACY and S. B. HARKNESS referred to on page 191 of our last issue as being about to be placed, has been secured by Fried Krupp, of Kiel. Krupp Diesel single-screw engines will be installed in each case.

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The fleet of steamers and motorships now owned by the Standard Oil Co. of N. J. aggregates 897,000 tons. Including chartered ships, the total is 1,100,000 tons. This represents the largest privately owned fleet of merchant ships flying the American flag. It also represents one-seventh of the world's tanker tonnage.

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In the fishing vessel ELIZABETH EDWARDS owned by Edwards Bros. Fishing Co., East Hampton, L. I., has been installed a 180 b.h.p. four-cycle type Nelseco Diesel engine. The vessel is 90 ft. overall, by 82 ft. 6 in. water line, 21 ft. 6 in breadth and 7 ft. draft, speed 10 knots. She will operate in Long Island Sound.

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R. W. Allen's new auxiliary motor-yacht WANDERER illustrated on page 39 of our January issue has been completely electrified. The 140 b.h.p. Atlas-Imperial engine drives the propeller direct, but there is a 40 k.w. General Electric Diesel-generating set supplying current for the anchor windlass, sail hoists, refrigerating machinery, bilge pumps, lighting, ventilating, etc.

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Traffic records of the Panama Canal for the first half of the present fiscal year show that 123 transits have been made by motor-vessels and the number is steadily increasing. This compares with 121 transits for the fiscal year 1923, and 77 in 1922. So there is every indication that the number of ships used in the canal during 1924 will double that of last year.

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Because after three years of close observation no serious trouble has been experienced with the Diesel machinery of motorships classed with the American Bureau of Shipping, the Bureau has changed its period of inspection from annually to once every two years, reserving the right to assist on annual survey in case of engines of new design.

**57-foot oil-engined cruiser built by the Forestry Branch of the Department of Lands, British Columbia**

An 18,000 tons motorship is to be built for the Cosulich Line, of the Societe Triestina Navigazione. Augsburg Diesel drive with Foettinger hydraulic transformers will form the propelling power of this vessel. The Diesels will be built under license at the Odero Works, Italy, while the hull will be constructed at the Trieste Navigation Company's own yard at Monfalcone on the Adriatic coast.

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A 1,000 tons cargo motorship equipped with a 200 s.h.p. Werkspoor Diesel engine in 1910, or 14 years ago, has just been sold for $11,600 or $11 per deadweight ton, at the current rate of exchange. This denotes the value of Diesel power after 14 years operation, as it must be recalled that Italians have purchased her and that this sum really has much greater value in Italy. The vessel is the OESTEIN, ex-CORNELIUS.

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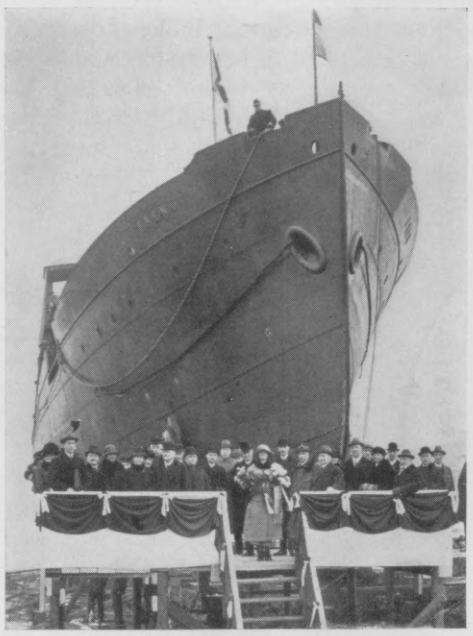
Authorization to furnish self-synchronous direct-current engine and docking telegraph systems has been received by Chas. Cory & Son, Inc., for the new 18,000 tons Ford motorships building at the American Shipbuilding and Great Lakes Engineering Works. Cory Anti-noise telephones and Magnavox patents will transmit navigation control conversations. Cory electric whistle-valve, automatic whistle-valve operation and associated parts will also be used.



**The single-screw passenger motorship "Frem," lately launched by Burmeister & Wain. One of their 1,125 i.h.p. Diesels is installed. Accommodation is provided for 250 first-class passengers. Length 225 ft., breadth 35 ft., depth 21 ft. 3 in Speed 13¼ knots**

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For the Hogarth Steamship Co., Glasgow, the 6,000 tons d.w. single-screw motorship BARON DALMENY has been launched on the Clyde by Wm. Hamilton & Co. A Cammell-Laird opposed-piston Diesel engine is installed, constructed by David Rowan & Co., Glasgow, 18½ in. diameter by 25 in. stroke. The deck machinery will be steam-driven. Dimensions, 360 ft. by 50 ft. by 26 ft. 3 in. Reference was made to this vessel on page 193 of our March issue.

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At the recent meeting of the Governing Council of the National Merchant Marine Association presided over by Senator Jos. E. Ransdell of Louisiana, endorsement was given to the Bill before Congress enabling the use of the Shipping Board Construction Loan Fund for the conversion of steamers to motorships. The Governing Council considered this the most immediate and direct means of promoting the efficiency and economy of American shipping in overseas commerce.

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Fairbanks-Morse of Chicago, who recently issued $3,500,000 in 7 per cent cumulative preferred stock, made a profit in 1923 of $2,469,547 after making liberal deductions for depreciation and other reserves. They are now the largest manufacturers of heavy-oil engines in the world—their annual output exceeding 100,000 horsepower. For three years steadily this company has been running three 8-hour shifts for 24 hours at their huge Beloit factory. Net sales last year for oil-engines and other products were nearly $26,000,000.

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The raised-deck cruiser B. C. FORESTER referred to previously in our pages as building for the Forestry Branch of the Department of Lands of British Columbia, has been completed. She is a 57 footer, powered with a Washington-Estep airless-injection Diesel engine of 50 b.h.p. at 325 r.p.m. on a weight of 12,500 lbs. with clutch. Although only a small engine, liners are fitted to the cylinders. The boat was built under the supervision of C. D. McKinnon, Superintendent of the Department's repairing station at Thurston Bay, B. C.

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British naval estimates for new construction include craft that the British press describes as an entirely new naval type, namely "submarine patrols" which are spoken of without explanation. Curiosity has been aroused in Great Britain as to what these vessels will be and to what function they are designed. This recalls to our mind that MOTORSHIP established the term "submarine patrol" in 1917, as being the best description for the 110 ft. boats built for the U. S. Navy. We considered that the name "submarine chaser" did not properly indicate the work that these boats carried out.

From French shipbuilders two motorships of 8,500 tons d.w. have been ordered by Wilh. Wilhelmsen of Tonsberg, owing to the low exchange rate enabling France to make lower bids than Norway, Sweden and Denmark. The order has been placed with the Saint Nazaire (Penhoet) Shipbuilding Company, St. Nazaire, and twin 2,000 i.h.p. Burmeister & Wain type Diesel engines will be installed. Dimensions, 415 ft. by 54½ ft. by 38 ft. Delivery will be made in 13 and 16 months respectively. One set of engines will be built in Denmark and the other at St. Nazaire under license.

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Twin 3,000 i.h.p. Harland-B. & W. Diesel engines are installed in the new twin-screw vessel GLENSHIEL, launched on January 24th, at the Harland & Wolff Belfast yard. Each engine has eight cylinders, 29.13″ bore by 45.27″ stroke, and turns at 115 r.p.m. The vessel is of 9,500 gross tons. Dimensions, 485 ft. x 62 ft. x 39 ft. 6 in. Accommodation is provided for a limited number of passengers, including dining-saloon and smoking room. All the engine-room auxiliary plant and all deck machinery is electrically driven. The passengers' accommodations are electrically heated, and there are eighteen 8-light cluster lamps for working the cargo at night.

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At a recent meeting of the Ocean Association of Marine Engineers there was given by J. Kuttner of the editorial staff of MOTORSHIP an interesting exhibition of moving picture films illustrating the Diesel-electric drive as applied to the TWIN PORTS. A talk and animated diagrams by the G. E. C. showing the arrangements of the various electrical circuits and controllers were given, which clearly indicated the way in which the electric transmission is effected. Bert L. Todd, secretary of the Association, gave a talk on thrift among marine operating-engineers, and showed how the Association's bank, known as "The Ocean Credit Union" will be of material benefit in promoting the welfare of those whose life-work it is to care for marine power-plants.

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ISPAHAN, the 1,000 tons displacement motorship, was recently placed in service in Germany on the Volga route from Petrograd to Persia, via the St. Mary Canal system, states a report issued by the Department of Commerce, Washington, D. C. She is a specially designed one-deck vessel with three 2-passenger staterooms, smoking-room and hospital. On her maiden voyage she arrived at Enzeli during November, 1923, and discharged approximately 726,000 kilos of miscellaneous cargo. The Robert Wonckhaus Co. has been granted certain privileges over the route by the Soviet Government, which owns half the capital invested. The balance of the capital is owned by the Russisch-Deutsche Transit and Handelsgesellschaft, composed of a number of German firms. The sister ship JOGAHAN has been renamed CHAMADAN. Reference to these vessels was made on page 697 of MOTORSHIP for October, 1923.

# Standardizing Airless-Injection Engines

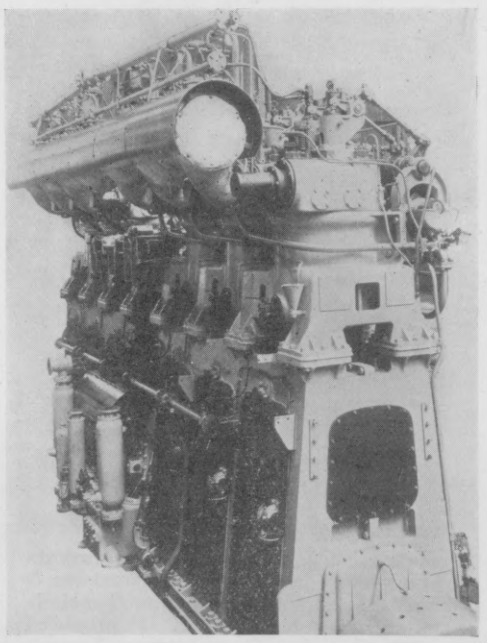
*Quantity Production Methods at Vickers' Plant Will Be Used in Putting on the Market a Type Which Has Become Stabilized by Years of Successful Operation at Sea*

AIR-INJECTION engines versus the airless type is one of those chronically unsettled questions of the oil-engine industry which lends plausibility to the view that mechanical engineering is not an exact science. Whereas a definite answer can be given to the question of which system gives better actual combustion, that is only a restricted phase of the matter To discriminate in a logical and dependable way between the two types it would be necessary to weigh carefully a number of additional engineering matters, such as the elimination of the compressor and the substitution of high-pressure fuel pumps.

To reduce these matters to figures is manifestly impossible and the other resources which the scientific mechanical engineer might command for the purpose of arriving at a decision have until now proved inadequate. All the more interesting, therefore, is a definite indication coming from quite another source, namely, the production department of a large and responsible firm that has had years of experience with the straight Diesel engine as well as with the airless injection machine.

A definite turn appears to have been given to the controversy by the bare fact that Vickers, Ltd., of Barrow, England, have decided to standardize their 600-b.h.p. airless-injection mercantile oil engine. When a firm goes in for quantity production of any piece of machinery it may be pretty well taken for granted that the last kinks have been ironed out of it. None but amateurs and beginners will incur heavy expenses for jigs, fixtures, and special machinery to be used on incompletely developed engines. So long as there is any possibility of experimentation or changes, quantity production remains a very expensive form of entertainment. The production, then, of Vickers airless-injection engines on a quantity basis throws a sidelight on the injection controversy which is a good deal more illuminating than any of the pronouncements hitherto made on this subject by mechanical engineers as such.

The new 600-b.h.p. Vickers engine is of a four-stroke type which has long been familiar to MOTORSHIP readers and develops its rating in six cylinders having bore and stroke dimensions of 18¼″x27″ and running at 155 r.p.m. Under these conditions the m.e.p. on a brake horsepower basis is calculated to be 72.5 lbs. per sq. in., a figure that is in no way inferior to that found in the most representative air-injection machines. We had the pleasure of seeing the first unit of this design on test when in England last summer.

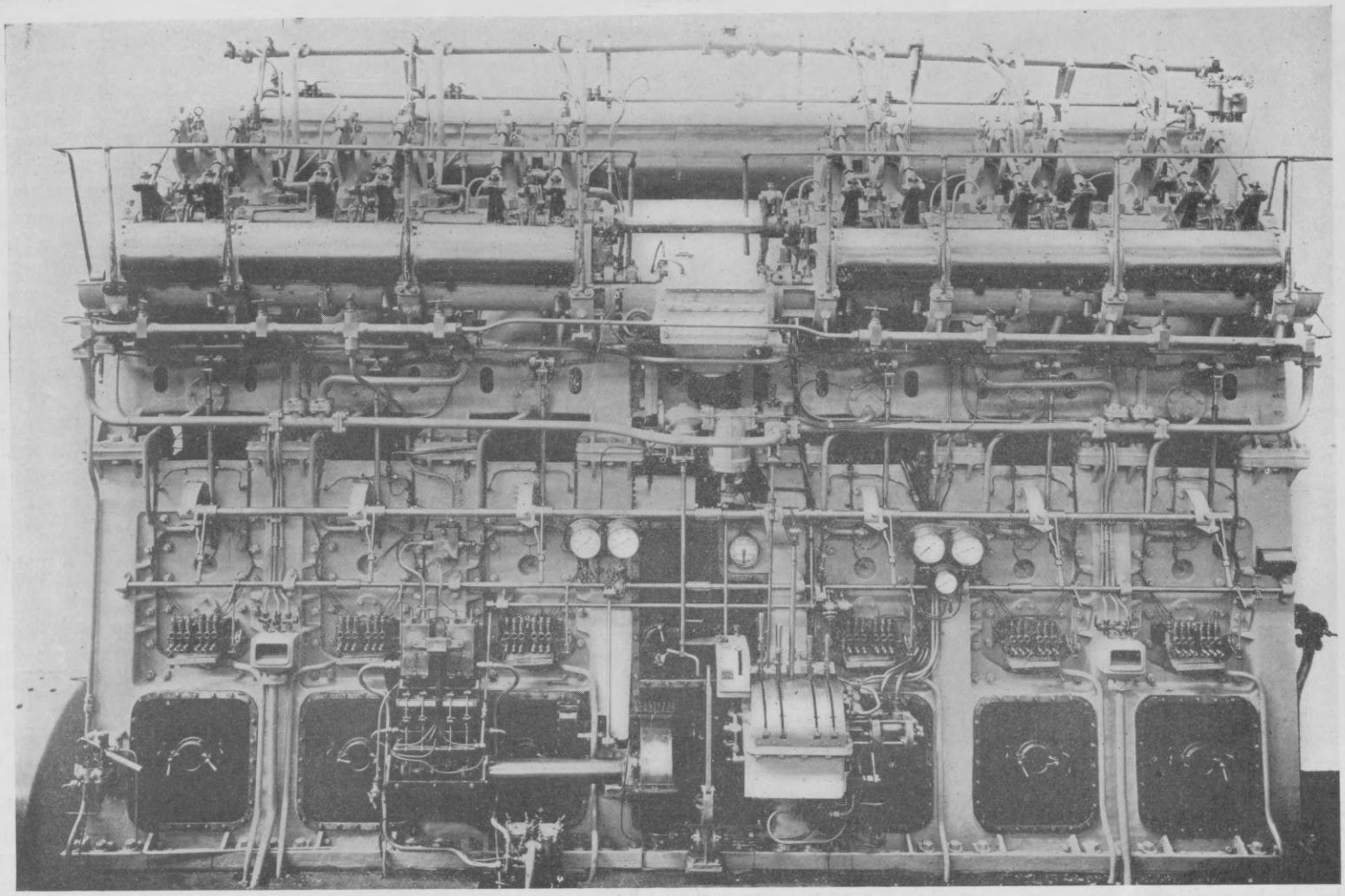


End and back of the new Vickers oil-engine, showing exhaust manifold

To permit of ready attachment to the tank-top of a ship, the bedplate has a flat bottom, a construction whose underlying principle is that of making the engine independent of reinforcement from the ship's steelwork. Resistance to deflections, not only such as are normally caused by the firing loads of the engine, but also by the working of the hull in a seaway is of the utmost importance and it is evident that the Vickers engineers have given this matter the considerations which it merits.

Surmounting the bedplate is a box-frame split on a longitudinal plane for the accommodation of crossheads and guides. Although it might be inferred that the side of the box on which the guides are mounted would be somewhat difficult of access, the large openings left between the upper end of the guides and the under side of the cylinder supports are sufficient for ready inspection and attendance. As the opposite side of the box is wide-open from bedplate to cylinder jacket, all moving parts can, in fact, be readily gotten at. Light, easily removable sheet-metal covers are kept in place during ordinary running for confining the splash from the forced lubrication.

Traversing the interior of the box-frame are massive webs located in the planes of the main bearings, to which they transmit the working-load reactions very directly and with a minimum of bending. Heavily-beaded arches of a height sufficient to prevent any interference with keying-up span the bearing-caps. So great is the inherent strength of this arrangement that the use of forged steel tie-rods can be dispensed



The new Vickers 600 s.h.p. crosshead-type airless-injection marine oil-engine

with, a departure which forcibly illustrates an ever more widely recognized truth applying to oil-engine design. According to this principle, the proportioning of oil engine parts in such a way as to guard against deflections insures that the requirements for mere strength will be automatically taken care of.

A governing idea which underlies the valve-gear arrangement of the standardized Vickers engine is that the tops of the cylinder heads shall be made entirely accessible. As in the designs on which it is based, there are eccentrically pivoted rocker arms, but they are placed away to one side of the cylinder heads and are connected to the actual valves by means of stout, easily removable push-rods. The withdrawal of valves and even cylinders can thus be accomplished virtually without disturbing the valve gear.

Reversal is carried out by means of the time-tried shifting camshaft. Rotating the valve-lever fulcrum shaft on which are mounted the eccentric bearings of the lever brings all the cam-rollers clear of the cam-noses and makes possible a sidewise shifting of the camshaft to bring the astern cams into engagement. There are so many reversing mechanisms in which this principle is successfully applied that it may be said to occupy the same position with reference to the oil engine as the Stephenson link does to steam engines.

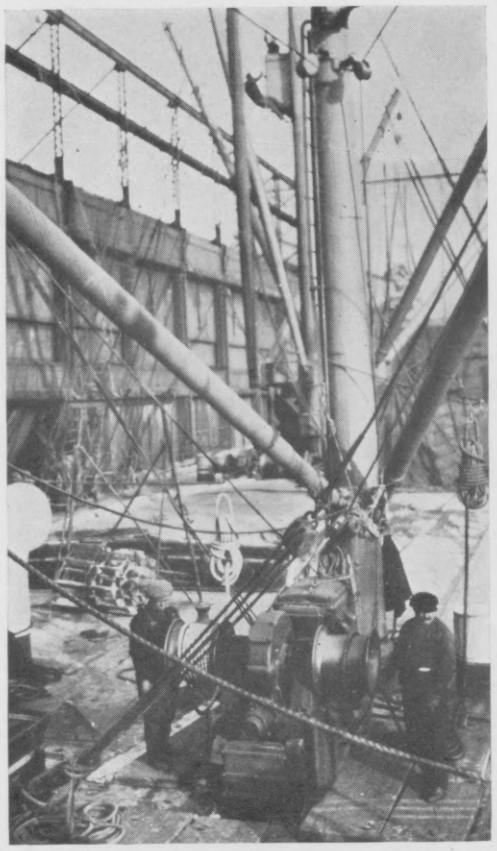
An unusual feature of the 600-b.h.p. Vickers engine is the use of uncooled pistons in spite of the fact that it is a good deal easier to fit piston-cooling gear to crosshead engines than to those of the trunk-piston type. The recent trend of oil engine design shows two opposing tendencies in this regard. On the one hand, trunk-piston engines are being offered in larger and larger units by the aid of the latest refinements in piston-cooling technique and on the other hand, crossheads are being applied to unit sizes for which they would have been considered out of place years ago. But there can be no doubt that in comparing uncooled trunk-type and crosshead piston, the latter has an undisputed advantage because of the fact that it can be fitted with a liberal clearance and is rendered immune against distortion by virtue of its shortness. Hundreds of uncooled trunk piston engines having a bore larger than 18¼" are in successful operation today and years of flawless running with 18¼" crosshead pistons would alone demonstrate that it is the right thing to use. At the moment engineering opinion differs as to the maximum size of uncooled piston that can be used with the proper factor of safety, and engine-speed has quite a determining influence. Eliminating the piston-cooling gear has so many advantages from a manufacturing and operating point of view that further elaboration of the subject is superfluous.

# How Long is the Effective Life of a Motorship

*Diesel-Driven Liner* MISSISSIPPI *Makes Uninterrupted Voyage Against Gales That Cripple General Shipping After Nine Years' Service*

"I HAVE spent my life on the sea since 1870, but this last voyage is the worst I have ever made," said Capt. J. T. J. Wylie of the Atlantic Transport motor cargo-liner MISSISSIPPI to a New York SUN reporter when she docked after a recent voyage. A passenger on the ship who had charge of a part of the valuable consignment of thoroughbred horses, Wynnie O'Connor, expressed himself in regard to the voyage as follows: "I've ridden since the age of nine; I've had my collar bone, alone, broken twelve times, and I've been generally tossed about all my life. But this trip we've just made is the roughest ride I've ever had or ever hope to have."

Such comment on the weather encountered by this veteran motorship, which has seen practically uninterrupted service since 1914, would appear at first to render further elaboration superfluous. Nevertheless, a great feat of navigation which has aroused so wide an interest in all circles



Deck scene on the "Mississippi," showing an electric winch in care-free operation after 19 days' battering by the worst waves of the season

and not alone among those directly connected with maritime affairs, was backed up and made possible solely by engineering accomplishments of the same high order. "Heavy continuous head gales that were met all the way from London," Chief Engineer L. F. P. Sorge said to a MOTORSHIP representative, "interfered not in the slightest with making a 19-day non-stop run." The intensity of the resistance against which the propelling machinery of the MISSISSIPPI, had to work may be judged by the fact that her engines were at times slowed down 30 per cent below their normal r.p.m. but they kept right on pounding out their regular m.e.p. without wavering for a moment. Owing to the fact that her cargo was bulky, the MISSISSIPPI had a mean draft of only 20 ft. 7 in. as against her full load draft of 27 ft., so that she exposed a high freeboard to the force of the gales.

While run under the British flag, a considerable amount of American capital is invested in this ship. She was built in 1914 by Harland & Wolff to the following general dimensions:

| | |
|---|---|
| Tonage | 6,500 tons d.w. |
| Length | 370 feet |
| Beam | 50 feet |
| Mean Full-Load Draft | 27 feet |
| Speed | 11½ knots |
| Power | 6.500 i.h.p. |

Her Diesel engines were also built by Harland & Wolff under Danish license, and as they were among the first of this type to be constructed by them, it is only natural that a number of difficulties had to be overcome before the makers were satisfied with their product. Whereas all the rugged excellence of the Burmeister & Wain designs was already present in 1914, it was not nearly such a cut-and-dried affair at that time as it is now to route a set of new license drawings through a shop unaccustomed to internal-combustion machinery. The main units consist of two Diesel engines having the following dimensions:

| | |
|---|---|
| No. of Cylinders | 6 |
| Stroke | 39⅜" |
| Bore | 26⅜" |
| R.P.M. | 110 |
| I.H.P. | 1,800 |

Auxiliary power for lighting, heating, pumping, cooking and hoisting is furnished by three direct-connected Diesel dynamos. Two of these are rated at 320 b.h.p. each and drive generators of 200 kw. capacity; the ratings of the third unit are 120 b.h.p. and 75 kw. Either one of the two larger sets is capable of swinging the entire auxiliary load alone and they are changed over regularly once a week. These engines are amply powered for the electrical machines which they have to drive, and it is apparent that the designers wanted to make sure that in case of overloading or accident, it would be the dynamos that would let go first.

Not a single steam pipe is in commission on this vessel. There is, indeed, a lonely steam set consisting of a small oil-fired donkey-boiler connected to an emergency compressor, to be used in case starting or injection air should ever be lost. Since the time when official dock trials were run, this steam unit was never again used.

Cooling water is supplied by two centrifugal pumps direct-connected to electric motors; but the pumps for lubricating and bilges are all of the plunger pattern and are electrically driven through the medium of gears. The wisdom of this arrangement is apparent to those who have had wide experiences with centrifugal types of pumps when the latter are employed for more complicated services such as for filling and emptying tanks. For a simple job like supplying cooling water they are admirably adapted, particularly because there is never any suction head to contend with.

In 1917 the oil cooling system for the main engine pistons was replaced by a fresh water system and during the following six years of continuous operation the vessel has had no delays of any kind occasioned by engine-room repairs. Routine overhauls never amounted to more than what could be accomplished while the vessel was discharging and loading cargo; in a steam vessel the necessity for scaling boilers would have caused periodic withdrawals from service amounting to many weeks of expenses and lost earnings. Chief-Engineer Sorge has been with the MISSISSIPPI ever since the time when her engines were turned over for the first time. He took part in the work of tuning them up and licking them into shape and although he is free to admit that this involved plenty of hard work at first, he is so thoroughly satisfied with his installation that he has never left it in all the nine years of its being in commission.

The Chief knows the value of keeping good records of his work and the compilations of data which he hands in after every voyage are the clearest, neatest, and most complete which it has ever been the good fortune of MOTORSHIP to see. Clean, economical combustion and good work with the engine indicator are also among the features of the Chief's management of his engine-room. The indicator cards which he takes at close and regular intervals from the twelve engine cylinders in his charge were without exception fine specimens of the art. There was not the trace of a smudge on any of them. All the combustion lines of the indicator cards were free from abnormal pressure rises and showed that ignition

Chief Engineer L. F. P. Sorge (right) with his assistants. He has been with the "Mississippi" ever since she went into commission, 9 years ago

RECENT VOYAGES OF MS MISSISSIPPI

| Approx. Date | Route | Dist. Miles | Time Days | Tons Total Fuel | Tons per 100 Naut. Miles | Speed (Knots) |
|---|---|---|---|---|---|---|
| June, '23 | London New York | 3,405 | 13 | 134 | 3.94 | 10.72 |
| July, '23 | New York London | 3,451 | 12½ | 141 | 4.09 | 11.04 |
| Sept. '23 | Plymouth New York | 2,998 | 12 | 119 | 3.99 | 10.34 |
| Oct. '23 | Halifax London | 2,812 | 10 | 114½ | 4.07 | 11.0 |
| Nov. '23 | London New York | 3,283 | 13½ | 133 | 4.05 | 9.5 |
| Dec. '23 | Halifax London | 2,813 | 11 | 122 | 4.33 | 10.2 |
| Jan. '24 | London New York | 3,281 | 19 | 176 | 5.37 | 7.13 |

was beginning promptly. An outstanding feature of all of them was the clean and sharp demarcation between the end of the combustion line and the beginning of the expansion curve, which ended in a "toe" so slender as to rule out entirely the possibility of after-burning.

But it takes more than mere technical skill to operate a motorship, since blundering consists not only in damaging the engines by direct improper treatment, but also in failing to avoid repair drudgery and thereby losing the sympathy and confidence of the operating force. The MISSISSIPPI is what is technically known as a "happy ship," and by that is meant that the operating technique employed in her engine-room results in keeping her machinery in such fitness that livable working conditions and hours are assured to the members of the grew. The latter consists of 15 men, including the Chief Engineer, two electricians and two storekeepers.

The wisdom of carrying two electricians on a ship where the guiding idea is "Do it electrically," is too obvious to need comment. Storekeepers, not often found on the engine-room crew lists of motorships, may be considered as a luxury by American shipowners. On the other hand the success or failure of some vessels has hinged upon the management of supplies, not so much from the monetary point of view of keeping down purchasing costs, as of having needed materials promptly available in emergencies. In the routine of upkeep, too, needed replacements are much more apt to be regularly and economically made if necessaries come to hand easily and without haste.

Watches on the MISSISSIPPI are arranged as follows:

| 4-8 | 8-12 | 12-4 |
|---|---|---|
| Senior Second Engineer | Senior Third Engineer | Junior Second Engineer |
| Junior Third Engineer | Junior Fourth Engineer | Senior Fourth Engineer |
| Oiler | Oiler | Oiler |

The remaining two electricians and two storekeepers are assigned to 8-hour duty or to hours such as occasion demands.

The Chief is an enthusiastic protagonist for electric winches, saying that their upkeep involves only a fraction of what is usual for steam-driven machinery of this class. The hoisting gear which we found in active operation on the decks of the MISSISSIPPI was built by the Sunderland Forge and Engineering Co., motors for winches supplied by Sunderland Forge. All other motors and generators were supplied by Lawrence Scott & Co. It was evident from their appearance that they have seen many years of hard service; but the ruggedness of their design and the effectiveness of the watertight housings with which they are protected has made them stand up remarkably in the past and assures their good performance for many years to come.

Many more details giving additional evidence that there is a habit of doing things right on board of the MISSISSIPPI might be described, and we have had to content ourselves with showing that a thoroughbred motorship like the MISSISSIPPI *must* make good, in emergencies or otherwise over a period of years.

We draw the attention of steamship operators to the fact that for seven one-way transatlantic voyages totalling 22,043 nautical-miles she only burned 939½ tons of fuel. A steamer would have consumed 3,000 tons of oil or about 3,500 tons of coal, and averaged a lower speed.

## Tank Sludge Removal

Ridding a motorship's fuel tanks of sludge and much is a matter whose importance has in the past been equalled only by its disagreeableness. A process for quick and painless sludge removal has recently been applied with commercial success by the H. J. Wheeler Salvage Company of Brooklyn, who have also been successful in a suit to prevent infringement of their tank-cleaning patent. A decision was handed down in the United States District Court, Eastern District, against another firm preventing them from using the ingenious method which is being exploited by the Wheeler Co. It is understood that an appeal has been applied for by the other concern.

Until recently no system for mechanically handling was successful as the sludge is too thick and jelly-like for pumping. Air suction combined with a partial breaking of the vacuum and consequent churning up of the sludge are the fundamental ideas involved. The apparatus consists of a suction pump, vacuum tank and hose connections all carried in a barge. The latter is brought alongside the ship and the suction hose is lowered into the tanks to be cleaned, the end of the hose being submerged in the sludge. The vacuum of about 20 inches is able to lift the solid sludge only a short distance. An air inlet located in the suction leg just above the fluid level permits the entrance of sufficient air at high velocity to form an emulsion. This can be easily carried through the suction hose and into the settling tank in the barge. By this method sludge has been lifted from tanks against a head of as much as 65 feet.

Several advantages accrue from the method under discussion. Sludge removal can be completed in a fraction of the time required for cleaning by hand, and the expense is more than correspondingly reduced. Furthermore, during the process of air-churning, the oil becomes freed from the water and impurities and rises to the surface in the vacuum tank. The water and impurities beneath it are then disposed of and the remaining good oil can be utilized.

It appears as though the company which is offering this salvage service is altogether too modest in claiming that the retrieved oil can be utilized only under boilers. Diesel engines in Europe operate year in and year out on coal-tar oil and mazout. The former resembles carbolic acid in the way it attack's one's fingernails and the bright-work of engines, while the latter has a consistency at ordinary temperatures such that a stick thrust into it will stay where it has been left.

To burn such fuels with success a technique different from that necessary for ordinary oils is naturally employed, but there is no such mystery about it as is sometimes supposed. All that is needed is a centrifugal purifier, an apparatus which positively removes water and solid impurities.

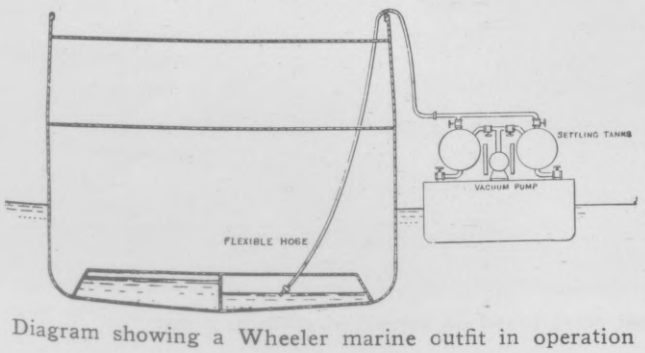


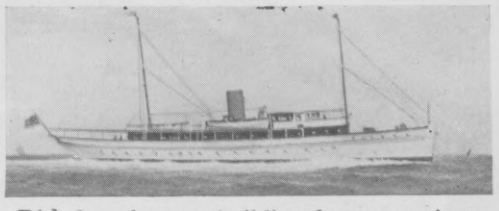
Diagram showing a Wheeler marine outfit in operation

## Diesel Yacht of 1,000 s.h.p. for New York Millionaire

A prominent millionaire yachtsman of New York recently placed an order in Europe for a large Diesel-driven yacht which will be delivered early in the summer. She is from designs by Cox & Stevens. As will be seen by the illustration, she is in some respects a departure from Diesel yachts previously designed by this concern. She has a straight stem, a continuous and lively sheer and a moderate over-hang aft ending in a transom. Her dimensions are as follows:

| | |
|---|---|
| Length o. a. | 158 ft. 6 in. |
| Length w. l. | 148 ft. 0 in. |
| Breadth | 26 ft. 0 in. |
| Draft | 11 ft. 0 in. |
| Power | 1,000 s.h.p. |
| Cruising radius | 6,000 nau. miles. |

Her hull is of steel to Lloyds Register, and there is a continuous steel deckhouse on the main deck with an inside passageway. Above this deck are two teak deckhouses with a stack amidships for engine exhaust and ventilating purposes. Power will be provided by twin Diesel engines aggregating 1,000 s.h.p. This has been installed in an engine-room practically amidships, this space being separated from the living quarters by watertight steel bulkheads. When completed she will be a magnificent vessel in every way, and at that time we hope to publish interior illustrations as well as a complete description.

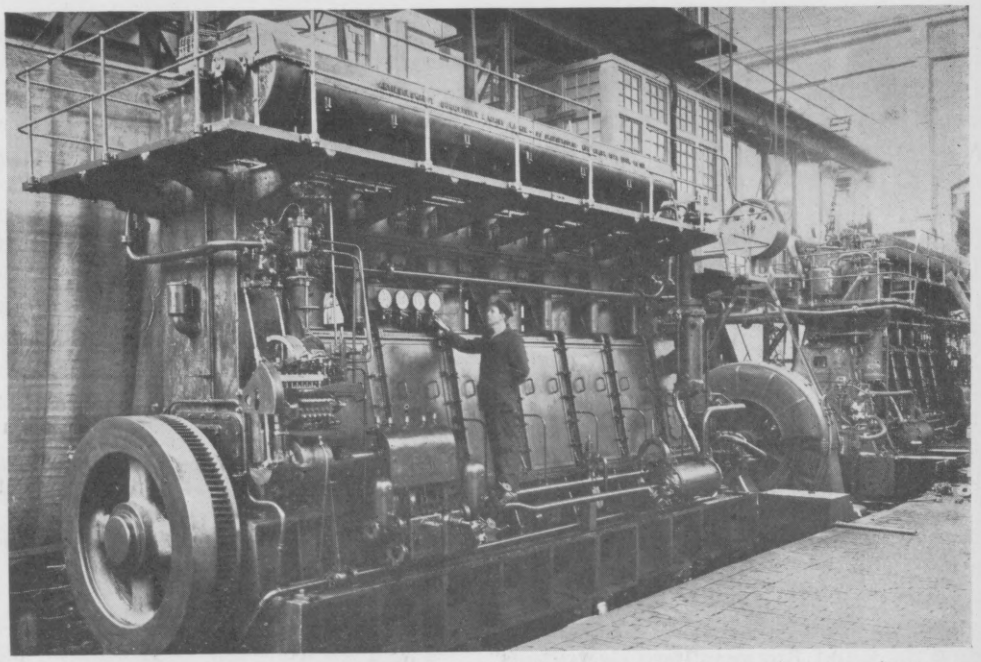

Diesel yacht now building for a prominent New York millionaire yachtsman

## MORE TRUNK-PISTON ENGINES FOR LARGE SHIPS

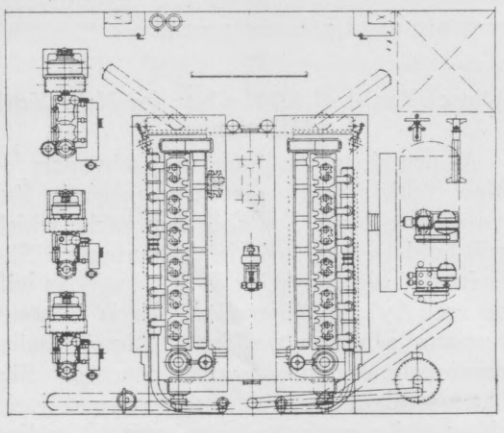
### Direct-Drive Units with Oil-cooled Pistons Running at Comparatively High Speeds are Proving Successful and Should Find Wide Application

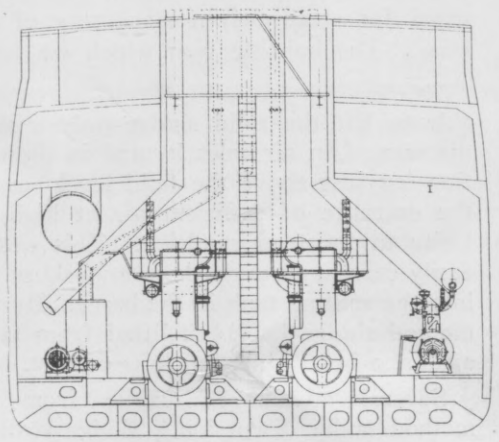
Two more large motorships propelled by trunk-piston oil engines similar to those of the ms. CRUX described in MOTORSHIP for September 1923, have run trials and have been turned over to their owner, A. P. Moeller of Copenhagen. The hulls were built at the Odense shipyard, and the ma- cylinder 50 h.p. 30 kw. Burmeister & Wain They are sister ships named CHASTINE MAERSK and EMMA MAERSK and have the following particulars:

| | |
|---|---|
| Deadweight capacity ..... | 7,980 tons. |
| Capacity of holds (grain)... | 422,350 cu. ft. |
| Capacity of deep tank (fuel). | 83 tons |
| Capacity of double bottoms (fuel) ..... | 1,036 tons |
| Indicated power of 2 main engines (total) ..... | 2,200 i.h.p. |
| Bore and stroke (4-cycle, 6 cylinders) ..... | 19-11/16"x35-7/16" |
| Speed of main engines..... | 150 r.p.m. |
| Length b.p. ..... | 378' 2" |
| Beam, moulded ..... | 50' 0" |
| Depth to upper deck ..... | 26' 5" |
| Speed of ship on trial..... | 11 knots |



Eleven hundred horsepower are produced by this oil-cooled trunk-piston engine at a speed of 150 r.p.m. These engines are direct-connected to the twin-screws of the motorships "Crux," "Chastine Maersk," and "Emma Maersk"





Oil-cooled trunk-piston engines develop 2,300 i.h.p. and make possible a neat engine-room arrangement on the "Emma Maersk"

Thrige electric winches of four tons' and fifteen tons' capacity and a Brown Brothers hydro-electric steering-engine are provided, power for which is furnished by two single-cylinder 50-h.p. 30 kw. Burmeister & Wain Diesel-drive generators. A two-cylinder 100 h.p. 66 kw. Diesel generator and a direct-connected motor-driven air compressor complete the power equipment of the engine room.

The use of comparatively high-speed trunk-piston engines for such large powers as this marks a distinct advance in motorship practise, and we hope soon to be in a position to give a detailed account of these interesting units.


This ship attained a speed of 11 knots on trial with engines of a type not often found on vessels of so large a size

# Ore-Carrying Motorship Nuolja's Maiden Voyage

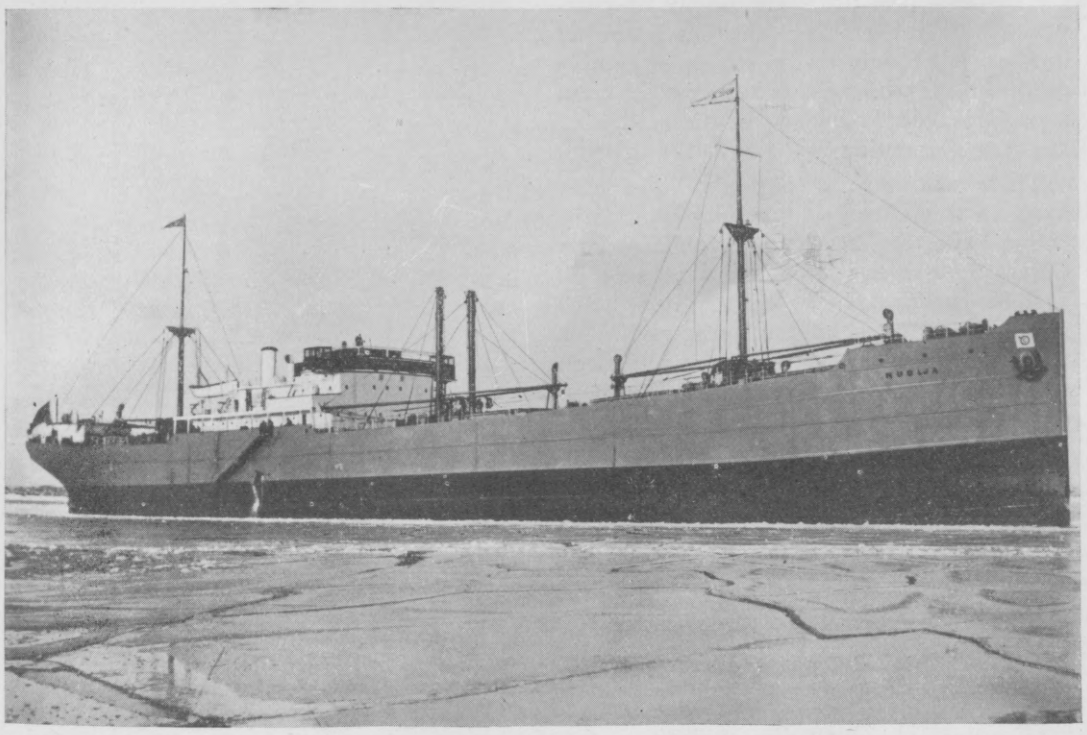
### Engine-room Crew Did Not Go Aboard Until Day of Trial Trip

When in Gothenburg last summer we had the pleasure of witnessing the launching of the 10,500 tons d.w. ore-carrying motorship NUOLJA at the Götaverken, which vessel is one of sixteen Diesel boats built and building at this yard to the order of the Tt. Grangesburg-Oxelosund, Stockholm. This craft was launched on August 14th and was due for delivery this month. A month following the launch, however, her owners urged the builders to deliver the vessel earlier and a date of December 29th was agreed upon. The installation of the Diesel machinery was finished on December 27th, when the machinery was given a three hours dock test. On the following day the crew were shipped, as well as provisions for a 40 days trip, to San Francisco, and stores for a year's absence. At eight o'clock of the morning of the 29th the NUOLJA left the fitting-out pier at the yard, and sea trials were run between noon and 4 p.m. At six o'clock the representatives of the owners left the ship, which remained in the harbor ready to sail at dawn.

Early on the morning of the 30th, the vessel left Gothenburg for Colon, Panama, which she reached after a successful trip of 21 days, in spite of a hurricane encountered in the Atlantic. No troubles of any kind were met, and the only stop of either engine was one of five minutes on the starboard unit for an adjustment to one of the valves. The average speed maintained was 10.37 knots on a fuel-oil consumption of 136 grams (0.3 lb.) per i.h.p. hour.

What may be remarkable in connection with this trip is that the engineers had not been aboard, and did not see the machinery, until the day prior to the departure of the vessel.

The NUOLJA is a twin-screw ship, the aggregate power of her two Diesel engines being 2,750 i.h.p. They are Götaverken-built Burmeister & Wain type Diesels. In addition there are three auxiliary oil engines of 75 b.h.p. each. There is no need to comment on this performance, as the data as it stands pays high testimony to the builders.



Ore-carrying motorship "Nuolja," which made a transatlantic voyage with an engine-room crew entirely new to the ship

## Recent German Diesel-Engine Developments

By the use of supercharging a four-cycle Diesel engine delivering 1,250 b.h.p. per cylinder has been developed by the Deutsche Werft in Hamburg.

* * *

Flexible shafts and flywheels have been applied with success to the reduction gear drives of the Hamburg American Line motor-freighters propelled by former submarine Diesel engines. Similar machinery is to be installed in passenger ships of the same line, the four-cycle Diesel of which will be equipped with superchargers.

According to Director E. Goos of the Hamburg American Line, operating costs of coal burning steamships, oil-fired steamers, and motorships may be compared according to the following index figures:

| | Coal-fired Steamer | Oil-fired Steamer | Motor Vessel |
|---|---|---|---|
| Operating Costs Alone..... | 100 | 102.5 | 54.5 |
| Ditto, incl. 15% Interest and Amortization ..... | 100 | 104 | 78.5 |
| All Costs incl. Maintenance.. | 100 | 103 | 80 |

These figures are based on the operating results that have been obtained to date from the Hamburg American Line motorships, MUENSTERLAND and RHEINLAND, having geared and direct-drive Diesel engines respectively and from one of their coal-fired turbine steamships.

* * *

Experience accumulated on motorships by the Hamburg American Line indicates that fresh water is the most desirable cooling medium for all parts of a Diesel engine. They are planning also to utilize the heat of the exhaust gases on a comprehensive scale.

* * *

As a successor to the 12,000-h.p. Diesel engine a description of which was concluded in our last issue there is now being built at the Augsburg works a double-acting two-cycle oil engine having a bore of 31½ inches and a stroke of 41½ and turning at 90 r.p.m. At a mean-effective pressure of 90 lbs. per sq. in. indicated this engine will yield over 1,000 b.h.p. per cylinder. To insure the best possible distribution of fuel in the crank-end combustion space, no fewer than four fuel valves will be used. Air injection will be fitted on the first engine, but airless-injection is contemplated for succeeding units.

## Others Believed This Two Years Ago, But Not Today!

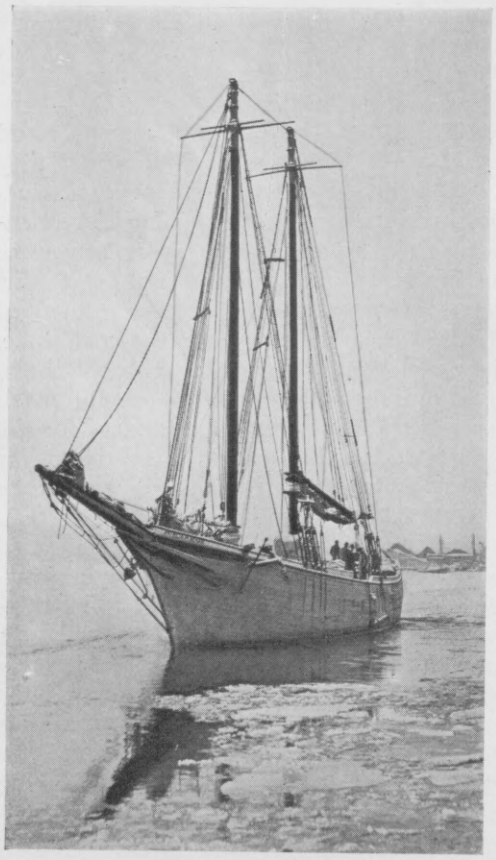
At the recent launch of a 7,700 tons steamer at South Shields, England, Sir James Readhead, of the old shipbuilding concern of similar name, said that "the Diesel had been referred to as the ship of the future, but his view was that Diesel-engined ships at the present moment could not compete with the class of vessel they had launched that day. Moreover, his customers were not inquiring for Diesel-engined craft as shipowners apparently were not prepared to take the risk. If this engine ever became universally recognized it would be a bad thing for the coal trade, and if oil were brought to Great Britain, to any appreciable extent it would mean that capital would leave the country for the benefit of the foreigner. Also the boiler maker as a type of workman would be wiped out." We might add—and the boiler's cost and upkeep saved to the benefit of the shipowner. Absence of boilers in a vessel should produce no regrets to a shipowner. Sir James' line of reasoning is hardly one which makes for advance in keeping with the progress that makes the world go on. It is too ultra-conservative and not quite in accord with current facts. On the same day at a meeting in London of the Society of Consulting Marine Engineers & Ship Surveyors, C. M. Burls of the Council stated that the progress of the Diesel was the most remarkable event in the shipping world, and that in 1924 figures of vessels under construction showed that 80 per cent were motorships.

T. R. Harrison has assumed charge of the Research Department of The Brown Instrument Company. Mr. Harrison was formerly associated with the Pyrometry Department of the Bureau of Standards and more recently with the Champion Porcelain Company of Detroit.

### Motor Auxiliary Among Aborigines

Installing oil-engines to be used in regions far removed from civilization is perhaps as good a proof as anyone could want of the trustworthiness of any particular make of machine. Although it might be argued that such distant propelling plants are not adapted for showing off to those whose interests render them prospective oil engine users, it is equally true that reports of successful operation coming from wild and uninhabited regions carry conviction because of their demonstrating forcefully that the job must and can run itself.

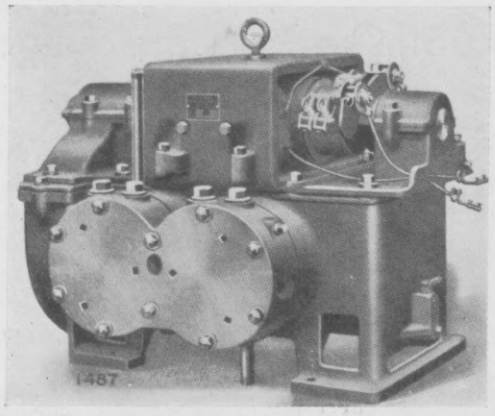
Such is the impression created by reports concerning the Canadian schooner PATRICIA M. BEHAN, having a length of 98 ft., a beam of 21 ft., and drawing six feet of water forward and nine feet aft. She is equipped with auxiliary power consisting of a Wolverine 95-h.p. 4-cylinder heavy oil engine. This boat will be used on the north coast of Panama for distributing merchandise to a series of stores scattered along the coast and will pick up the produce that the stores obtain from the native growers. These are mostly Indians of the San Blas tribe who harvest cocoanuts and ivory nuts and who have kept their racial characteristics intact throughout many generations.



Canadian schooner "Patricia M. Behan," powered with a 95 s.h.p. Wolverine oil-engine

### Traction Compressors at Sea

Compressed air belongs to the category of first and last things on all motorships, no matter what particular system of oil engine may be employed for propelling them. The part played by it in air-injection engines of the Diesel type is of course obvious, but it is equally impossible to operate an airless-injection machine if no starting air is available for getting it under way. Engines of so small a size that they can be started by hand are a rarity.



Type of air-compressor manufactured by the Westinghouse Traction Brake Company for installation in motor-craft

A wise policy to pursue in selecting compressed-air equipment for so vital a service as that of motorship operation is to look around in other fields of activity in which compressed-air also plays a rôle of life-and-death importance and to use the apparatus which has there shown itself fittest to survive. In railway and street-car operation, for instance, the unfailing supply of compressed air for braking purposes is second in importance only to the supply of motive power and carries even greater weight from a negative point of view, in the matter of accident prevention.

There are few persons who have ever lived in a civilized community who have not at some time heard the throbbing of an electrically-driven air-brake compressor on a street-car or subway train. It remains for the circumspect engineer responsible for the safe equipping of motorships to heed this homely lesson of every-day life and to reflect that an apparatus which has shown such dog-like faithfulness in avoiding smash-ups and tragedy on land must be capable of doing the same thing at sea.

A beginning has already been made on W. R. Mellon's motor yacht VAGABONDIA, on which one of the Westinghouse Traction Brake Company's motor compressors of the type illustrated herewith has been installed.

### Hot Water by Electricity

Piping hot water around a ship is undesirable in so many ways that it is not often done, although the demand and uses for hot water are such that a really practical way for meeting this requirement is something that will command the attention of all those concerned with the equipping of vessels. Aside from the large heat losses that occur even when lagged pipes are used, maintenance is disproportionately large because of the fact that hot water, even though entirely uncontaminated by salt, is considerably more corrosive than cold water.

Apparatus for heating water is generally not welcome in the engine-room because it is apt to be neglected in favor of that equipment which is essential to the running of the ship. In most of the installations on which it has been provided, it is found to be chronically out of repair.

The solution lies in the electrical method. On motorships, in particular, light, heat, and auxiliary power are being taken care of electrically to an ever increasing extent, a fact which has a solid foundation in the pronounced economies which are thereby effected. Apparatus for making hot water by means of electricity requires neither piping nor wiring outside of that necesary for connecting it to existing mains. As it consists mainly of a well-lagged sheet-metal shell, radiation losses are only a small fraction of those which occur in networks of pipes and current is automatically shut off.

A hot water heater which embodies these features is in use on the United American Line motorship SEEKONK, described in recent issues of this magazine. It is manufactured by the Automatic Electric Heater Company, of Warren, Pa.


Electric hot water heater on the motorship "Seekonk," Norwegian Shipowners and Diesel Power

### Norwegian Motorshipping

Motorship tonnage recently ordered by Norwegians exceeds steamship tonnage by 350 per cent, says the NORWEGIAN MERCANTILE AND SHIPPING GAZETTE. In addition to the 28 motorships aggregating 233,700 tons ordered abroad by Norwegians, and published on page 190 of our March issue, we understand that A. F. Klaveness & Co. have ordered two 500 tons (5,000?) 11¼ knot shelterdeck motorships with A.E.G.-B.&W. Diesels from the Deutsche Werft of Hamburg. Laurit Kloster has also ordered a motor freighter to have Kockums-Augsburg Diesel engines from the Kockums yard, Malmo, while Fearnley & Eager have ordered a third motorship from the Deutsche Werft, Hamburg. At the beginning of the year the Norwegian merchant marine consisted of 561 sailing ships, 628 steamers and 852 motor vessels.

### Sheepshead Bay Fleet and Bessemer-Atlas Engines

Sheepshead Bay, a teeming resort which provides a fresh-air outlet for the pent-up millions of metropolitan New York and which also boasts of an active fishing industry, is beginning to swarm with oil-engined craft. Among the last of the steamers to be brought up-to-date by conversion are the GIRALDA and the GLORY, well-known to countless fishing parties which they have carried out of the mouth of the Bay. Steam engines and boilers in both of them are being replaced by reversible six-cylinder Bessemer-Atlas Diesel engines.

The GLORY is 110 ft. long and her new oil engine develops 360 s.h.p. The GIRALDA is somewhat larger and will receive a 420 s.h.p. unit. On both boats 50 b.h.p. Bessemer-Atlas engines will be direct-connected to electric generators for lighting, heating, and auxiliary power, and will be used for running electrically-driven pumps, air-compressor, anchor windlass, and steering gear. A speed of 15 knots is expected for the larger boat, which, it is claimed, will make her the fastest oil-engine powered vessel of this class in service on the Atlantic Seaboard.

Accessories for these boats will be in line with the most modern practise. Exhaust pyrometers and electric alarm thermometers will be fitted and operating costs further reduced by the use of revolution counters and direct-reading tachometers. These installations have apparently been made with a keen perception for the latest methods of realizing to the utmost the economies inherent in the prime movers themselves. Money can be saved with the oil engines alone but the gains are capable of further substantial increases made possible by the use of recording and checking equipment.

Sheepshead Bay will thus be enriched by craft of a superior type which affords an interesting comparison, in the refinements of its power plant and accessories, with the proud vessels of the ocean-going motorship fleet.

### Furness Withy & Co.'s New Motorship Fleet

In addition to a number of motorships in service, Furness-Withy of London and New York have a considerable number of Diesel-driven vessels now under construction. It is interesting to note that they recently sold their 8,000 tons oil-fired steamer WYNCOTE.

The motorships building for Furness-Withy are as follows —

| Tonnage | S. H. P. | Make of Engine |
|---|---|---|
| 10,000 d. w. | 2,900 | Doxford |
| 10,000 d. w. | 2 900 | Doxford |
| 8,000 d. w. | 2 000 | Doxford |
| 8,000 d. w. | 2,000 | Doxford |
| 8,000 d. w. | 1,800 | Wallsend-Sulzer |
| 6.000 d. w. | 1,250 | Beardmore-Tosi |
| 6.000 d. w. | 1,250 | Beardmore-Tosi |
| Not given | 2,000 | North British |

The last vessel on the list will have the North British Company's new design of double-acting Diesel engine.

"Messenger," oil-engined, carries produce between Sandusky and Detroit

### Great Lakes Service Boat

Incomplete information is usually responsible for the expression of hasty opinions to the effect that oil-engine propulsion is advantageous only for this or that class of boat, but a comprehensive view of the entire situation such as is afforded to the publishers of a magazine internationally covering the application of heavy-oil engines to marine propulsion in all its phases ceaselessly reinforces the impression that the field of this type of prime mover is all-inclusive.

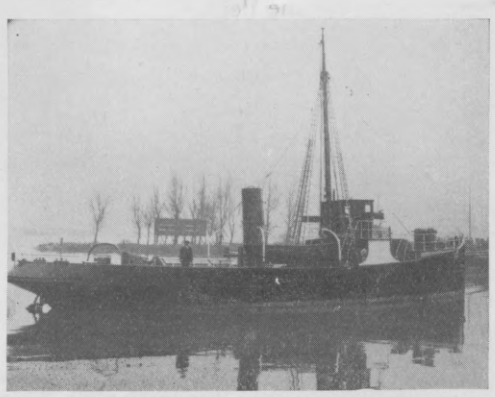
As an example of the smaller size of craft in which the advantages and economies of the oil engine can be realized information has come to us in the MESSENGER, owned by Capt. John P. Neuman, of Sandusky, Ohio, and powered with a Wolverine engine. Since September, 1923, he been runnng her as far as Detroit, Mich., for transporting produce.

### Trial of 1,700 H. P. Diesel Yacht, Owned by Oriental Prince

Sixteen knots was the speed attained on the mile test by the 800-ton motor yacht NAZ PERWER. On the 500-mile run she averaged 15⅛ knots. Twin 850 b.h.p. Sulzer Diesels propel this fine craft, which is owned by Prince Youssouf Kamal of Cairo, Egypt.

### Third Pilot Vessel for Flushing

During recent years three pilot vessels, powered with Atlas-Polar Diesel engines have been placed in operation of the pilot service at Flushing. The latest of these the "N.R. 3" has just run her trials. She was built by the Dordrecht Shipbuilding Co., Dordrecht, Holland, and averaged a speed of 10.5 knots at 213 propeller r.p.m. She was placed in service Nov. 30, 1923. The main engine is of the two cycle type with four cylinder 290 m.m. (11.41 in.) by 430 m.m. (16.92 in.) stroke. The length of the vessel is 94.4 ft. by 19 ft. breadth and 9½ ft. depth.



Flushing Pilot Boat No. 3, one of three sister vessels powered with a 200 s.h.p. Atlas-Polar Diesel engine

### Flotsam and Jetsam

A 150 s.h.p. Pacific-Werkspoor Diesel engine will be installed in a tugboat owned by the Daniel Contracting Company, of San Francisco.

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Manufacture of the Trout oil-engine has been taken over by the Bethlehem Shipbuilding Corp. and construction will be carried on at their Moore plant, Elizabeth, N. J.

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Miss V. Holmes of the Women's Engineering Society, will read a paper on heavy-oil engines, past, present and future, at Manchester during the meeting to be held April 2nd to April 5th.

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Twin 46-h.p. Wolverine heavy-oil engines will be used to propel a double-ended ferryboat owned by Harris County, Texas, and used for automobile transportation at Lynchburg, Texas.

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Among the numerous old-established gas engine manufacturers who do not regret having gone into the heavy-oil engine business is the Union Gas Engine Company. Following is a list of vessels recently equipped by them:

| Name of Boat | Kind of Boat | Length Feet | No. of Engines | Total B.h.p. | Name of Owners |
|---|---|---|---|---|---|
| LISTO | Towboat | 63 | 1 | 150 | Wilmington Transportation Co. |
| VIVO | Towboat | 63 | 1 | 150 | Wilmington Transportation Co. |
| PRINCESS | Glass Bottom | 84 | 2 | 160 | Wilmington Transportation Co. |
| ROSE | Launch | .. | 1 | 40 | Butler & Bell |
| Unnamed | Towboat | 56 | 1 | 110 | Powell River Co. |
| KITTIWAKE | Fisheries Service | .. | 1 | 65 | U. S. Government. |

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Reference was made in a recent issue to the formation of the Mianus Diesel Engine Co. and its consolidation with the old Mianus Motor Works. Wm. N. Shaw has joined the company. He is perhaps better known as president of the Eisemann Magneto Corporation. Mr. Shaw has been interested in Diesel engines since 1909, having been connected with Krupps, of Kiel, the American Krupp Company, and Carel Freres. Another director is F. S. Jerome, President of the Seymour Manufacturing Co. and the American Copper Products Corp. He is also active in the management of the Eisemann Magneto Corp.

A general-sales office will be opened at 165 Broadway, N. Y. C., in charge of P. G. Schilling, who has had considerable experience in the oil-engine business. Since March 1915, Mr. Schilling has been chief-engineer of the American Krupp Diesel Engine Co., of New York. Previously he was a designer in the engine department of Fried Krupp, of Kiel.

# Our Readers' Opinion

*(The publication of letters does not necessarily imply Editorial endorsement of opinions expressed)*

### Glad You Like It

*To the Editor of* MOTORSHIP:

Every issue of MOTORSHIP is a "pleasant surprise" in regard to new equipment. I can hardly wait for each issue to arrive.

Detroit, Mich. I. V. BEALL.

### Comments on the Greene Amendment

*To the Editor of* MOTORSHIP:

After carefully reading the draft of the Greene Amendment to the Jones' Act, both in your paper and in its official publication of H.R. 6202, I certainly cannot share your enthusiasm, as expressed by you in the inset on the first page of your February issue.

You say, "Not only will it be a splendid thing for our merchant marine, but it will provide badly needed work for American shipyards, oil-engine plants and for the manufacturers of all kinds of marine equipment." It is true that this is the case as applying to reconditioning done by the Shipping Board; but I cannot find any provision which would prevent a United States citizen from enjoying the loan benefits, even if he buys his "oil-engines and all kinds of marine equipment" in Europe, provided the work of "equipping" be done in shipyards of the United States.

In view of the fact that the conditions, as requiring that the engines be built in the United States, in order that the Board may benefit under this Amendment, are specifically set forth in Sec. 2, their omission from Sec. 1 will prevent the possible expansion of the meaning of "equipment by them in shipyards of the United States," to require the manufacture of the engines and appliances in the United States. And the contention that American builders of oil-engines and marine appliances will be protected by the fact that the loans to citizens are subject to conditions that the Board may prescribe, is hardly tenable, when the protection of the shipyards is categorically stipulated, and that of the machinery builders omitted.

As I have taken this matter up with several Congressmen and manufacturers of oil-engines, if I am wrong in my opinions I should like to know it as soon as possible. Also, in such case, I should like to know what objection there can be against the definite requirement that the oil-engines and all other equipment shall be of United States manufacture.

MAX ROTTER.

Busch-Sulzer Bros. Diesel Eng. Co.,
St. Louis, Mo.

[The loaning of money from the Jones' fund will be controlled by the Board. The question of foreign engines was raised by members of the Committee to Admiral Benson. Mr. Nicholson, Attorney for the Board, drew the Committee's attention to the following clause:

"The Board may use such fund to such an extent as it deems necessary and proper for making the loans to aid persons, citizens of the United States. (A) In the construction by them in private shipyards of the United States of vessels of the best and most efficient type, for the establishment or maintenance for service on land."

It is possible that the Board may consider that the words "construction and maintenance of service" (the latter meaning converting) of vessels in private shipyards to mean everything concerning the vessel, including machinery.

Congressman Bland raised the following question to Admiral Benson: "Is there anything to prohibit the use of foreign made engines"? Admiral Benson replied—"Except it says, built in the United States in private shipyards." Admiral Benson went on to say that in the case of the foreign engine being superior, he would give an American company every opportunity to develop it.

Mr. Nicholson then stated—"It is true, is it not, that under this Act they would actually have to do the construction work of building the engines here in America even under foreign patents"? Admiral Benson replied—"Absolutely."

Congressman Bland then stated—"That is the idea, and though the engine was of foreign patent, if the construction work were done in America it would meet the requirements of the provision?" To this Admiral Benson replied—"Exactly, in other words I might say the Board has taken every possible means to have every bit of labor and everything they can, done in this country." Mr. Nicholson advised Representative McKeown that the way the amendment was written limited purchases of Diesels to American manufacturers, so presumably "shipyards" includes "engine works." If foreign engines were superior to American Diesels they would be allowed inferred Admiral Benson.—*Editor.*]

### Perhaps We Never Went to College!

To the Editor of MOTORSHIP:

My comment is not along the same line of thought as expressed in your column entitled "Our Reader's Opinion," altho it is for the interests of motorship and engineering progress in general. As I have been one of your readers for several years, I have noticed at times that the method of presenting your thoughts is not strictly in keeping with the ideals that we try to inculcate into the minds of our students in the engineering colleges at the University of California. Our profession has been criticized for graduating men who cannot write reports or convey their thoughts in a clear and concise way. As our publications are read by the coming generation, I see no reason why the reports of progress made in motorship activities are not presented to the world in correct style without resorting to slang in places.

Pardon my criticism, if in your estimation I have been too severe. I appreciate your articles and commend you on your magazine.

CHARLES F. GROSS,
Asst. Prof. of Marine Engineering and Naval Architecture,
University of California,
Berkeley, Calif.

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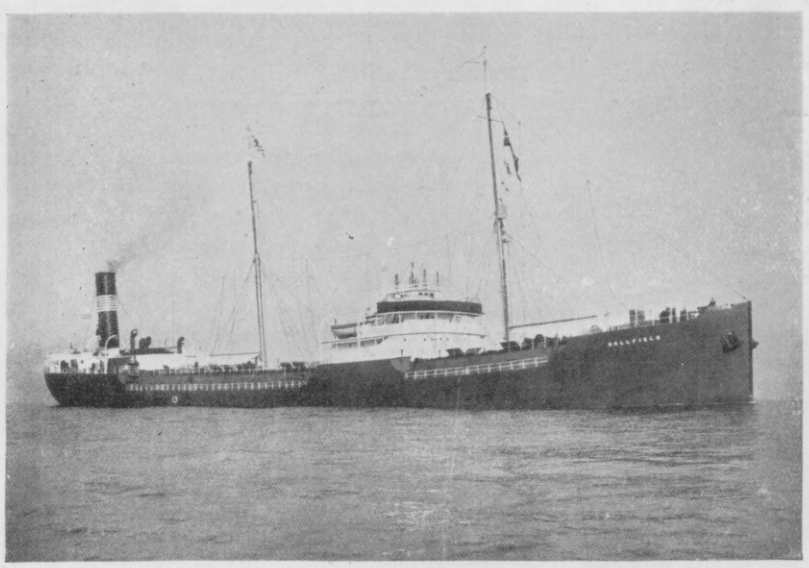
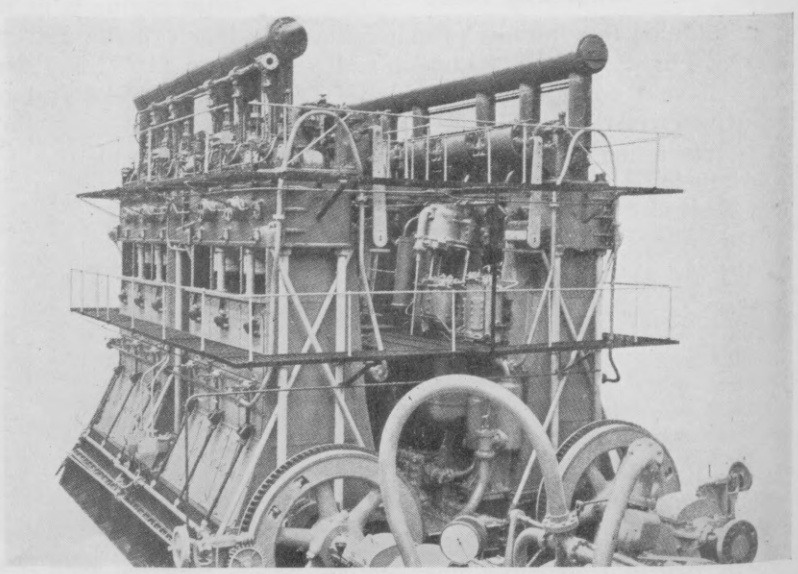
According to the annual report of the East Asiatic Co., they recently placed an order for another 12,000 ton motorship with Burmeister & Wain. For sometime past their large constructional program has been suspended.



"Wellfield," Hunting & Sons' new twin-screw motor-tanker which has just run successful trials



These twin 1,100 s.h.p. North Eastern-Werkspoor Diesel engines are installed in the tanker "Wellfield"

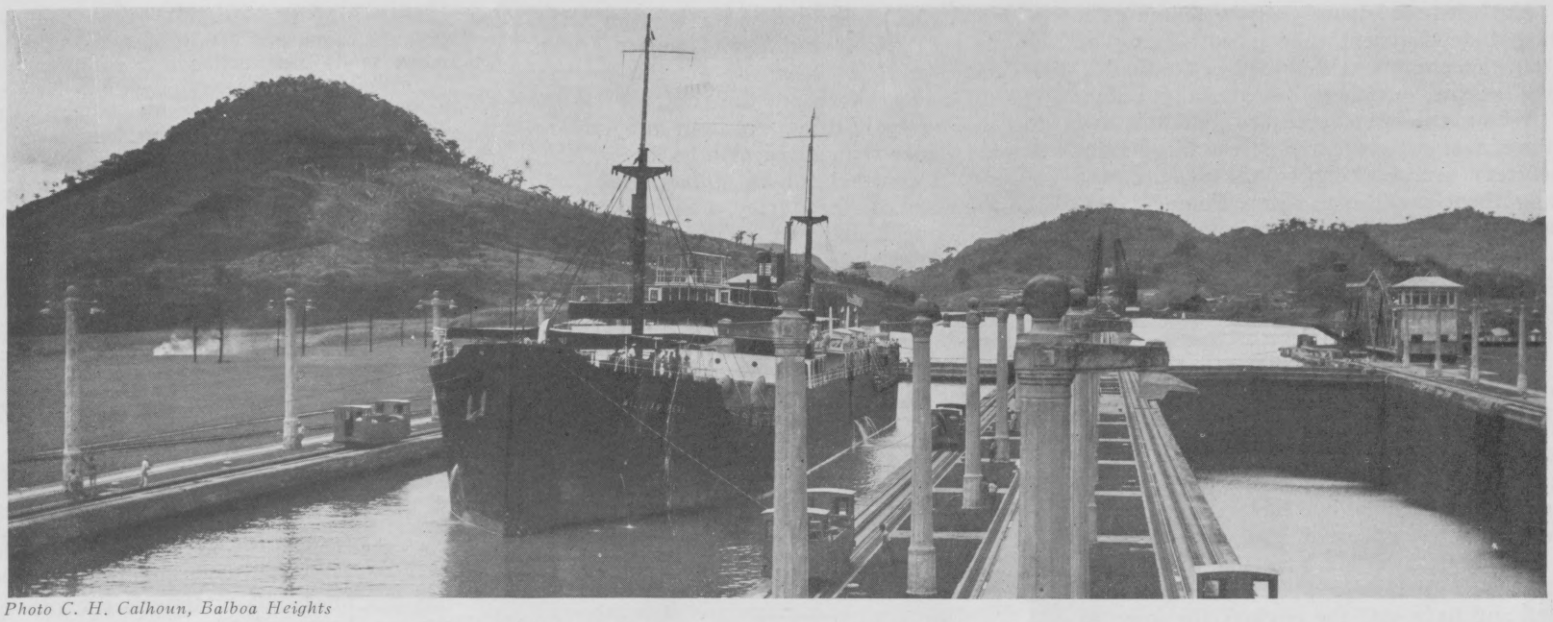


*Photo C. H. Calhoun, Balboa Heights*

**U. S. Shipping Board's cargo motorship, "William Penn," passing through the Pedro Miguel Lock of the Panama Canal. The Board recently refused an offer for her of $606,000**

# Congress and Steamer Conversions

*Testimonies Given Before the Committee on Merchant Marine and Fisheries, House of Representatives, Washington, D. C.*

MEMBERS OF COMMITTEE

William S. Greene, Chairman

| | |
|---|---|
| George W. Edmonds. | Ladislas Lazaro. |
| Frank D. Scott. | Edwin L. Davis. |
| Wallace H. White, Jr. | Schuyler Otis Bland. |
| Frederick R. Lehlbach. | Clay Stone Briggs. |
| Benjamin L. Rosenbloom. | William W. Larsen. |
| Arthur M. Free. | Tom D. McKeown. |
| Sid C. Roach. | George W. Lindsay. |
| Charles Brand. | William M. Croll. |
| Frank R. Reid. | Jeremiah E. O'Connell. |
| George M. Wertz. | Dan A. Sutherland. |
| Robert L. Bacon. | |

R. G. de Tonnancour, Clerk

Third and Final Installment

(*Continued from page* 210 *March*)

### Statement of Henry Moskowitz, Representing the New London Ship & Engine Co.

*Mr. Moskowitz:* I represent the New London Ship & Engine Co., a subsidiary of the Submarine Boat Corporation. The New London Ship & Engine Co. built the Nelseco Diesel engine. It has been on the market now for over 12 years, they have been operating for a decade, and the company has built about 230,000 horsepower of engines.

Now, we have also experimented with the Diesel engine in small craft, and recently we have demonstrated that by installing in five tugs a Diesel engine, two Diesel-engine types, one of 180 horsepower and the other of 240 horsepower, that we were able to reduce our operating expenses in connection with our Barge Canal service which runs from New York Bay to Buffalo, through the Barge Canal —we were able to reduce the operating expenses in this ratio. Before we installed the Diesel engine in these tugs we had coal-carrying tugs, steam propelled; after we installed the Diesel engine in those tugs we reduced the operation of five tugs so that the cost of five tugs amounted to the cost of one steam tug. In other words, there is a reduction in the ratio of one to five and this, gentlemen, amounted to the difference between a successful operating experiment and a nonsuccessful one, because we were able to reduce the operating cost on our Diesel-engine tugs to this extent that we were able to show black figures instead of red figures, and this in connection with small cargo vessels.

#### Standardizing Diesel Construction

Our company, as you gentlemen know, was the first company that built standardized ships. The Newark Bay Shipyard of the Submarine Boat Corporation took the first order from the United States Government for the building of 150 standardized ships of 350 deadweight tons. We were to build 150 of them and we delivered all but 32. The order for the 32 was canceled and the company purchased those 32 ships and has now been using them in connection with its trade and operating concern called the Trans-Marine Line, that has a service to the coast as well as a service to the South to Pensacola and Florida. The last of these ships, of the 150 ships, we decided to motorize. We decided to modernize those ships on the same basis, on the principle of standardization. We got the co-operation of an American builder, Mr. Craig of Jersey City, and we installed in this ship a 2,000 horsepower Diesel engine. We made a very substantial reduction in our operating cost. I cannot give you the exact figures, but if you gentlemen desire it, I can procure them for you. I think it amounts to about 40 per cent of the fuel-operating cost.

As I say, we built this particular engine, this 2,000-horsepower engine, on the basis of a standardized production. Our parts are not as heavy as the Scandinavian and German parts. They are replaceable, and we felt that if we made a success of this engine we could demonstrate the principle of standardization in the building of Diesel engines, and we feel that we have demonstrated this.

We are naturally very much interested in this resolution and in the amendment of section 11. We feel that the American Diesel engine industry will be developed by it, that the American merchant marine will be developed by it, and it will stimulate the building of Diesel engines in this country.

### Statement of Henry C. Wiltbank, Secretary National Merchant Marine Association:

*Mr. Wiltbank:* I was not able to be with you gentlemen throughout the whole session, but it struck me, from what I heard, there was one point that was not dwelt upon in any detail, that is, that today you are really standing still while the rest of the world is going ahead in this matter of securing motorships. I have thrown together a very brief outline and these figures are based on the tables of Lloyds Register of Shipping.

I find, as of last June 30, the last figures of record, taking all steel motor vessels owned through the world, the total was 1,321,000 gross tons of which the holdings of Great Britain were 375,000 gross tons, or 28 per cent. For the United States, it was 148,000 gross tons, or 11 per cent; for Denmark, 133,000 tons; Norway, 177,000 gross tons; Sweden, 174,000 gross tons. So that both Norway and Sweden own more motorships than we do. Germany then had 84,000 tons; Holland, 66,000 tons; Italy, 61,000 tons, and "all other countries," 104,000 tons. We are going rapidly out of the picture; and, if something is not done, will be out of the picture altogether.

### Statement of James C. Barnaby, Engineer, Worthington Pump & Machinery Corporation, New York, N. Y.:

*Mr. Barnaby:* Just a word in passing, Mr. Chairman. Two years ago this fund that is under consideration was set aside, and, as testified this morning, only $400,000 of it has been touched, and nobody mentioned the fact that $400,000 was used for Diesel-engine ships, which is interesting. And why should not this money all be made available for something that we know is going to be used? Already 13 vessels, approximately, have been taken over and converted.

I also want to say in connection with the development that is now going on that we can look for substantial developments in the Diesel-engine line in the next few years, although the present Diesel engine is a satisfactory piece of machinery and has gone beyond

the point where it is purely experimental. The principal development that is now going on both in this country and abroad is the double-acting engine, which will materially reduce the weight, the space occupied, and the cost of the machinery. Nearly all the large manufacturers are working to these ends, and among them the Worthington Pump & Machinery Corporation, who are now building double-acting, two-cycle engines of power and size suitable for this conversion work for single-screw propulsion, which will materially reduce the weight and space occupied.

### Statement of W. Z. Lockwood, of the McIntosh & Seymour Corporation:

*Mr. Lockwood:* You have heard from our Mr. Cooke this morning about a couple of Shipping Board ships we have converted. I think we have converted altogether four or five of them; that is, we have sold the engines for four or five ships that have been converted and have sold the engines for some 45 ships that have been built. I just mention this because it was stated there were only one or two ships, and we have engines in some 45 ships.

*Mr. Briggs:* What was the tonnage of those vessels; within what range?

*Mr. Lockwood:* I should say from 2,000 to 6,500 tons. They are all cargo boats.

*Mr. Briggs:* Dead-weight tonnage?

*Mr. Lockwood:* Yes, sir. The question came up before noon about the short hauls and the long hauls with Diesel engines; that is, it was brought out on the long haul the Diesel engine was economical and, on the short haul, that maybe it was not economical. It is a question of the stand-by loss—whether a ship is going to come in port and stay, or whether it is going back. In port, there is no stand-by loss in the case of the motorship and with the steamer you do have a stand-by loss; that is the difference. The boilers are kept going on the steamer while in port and when the vessel is ready to start they run up the steam pressure; whereas, with the motorship, all you have to do is to start the engines. The idea has been illustrated of the 10,000-ton ship, that you would possibly get 1,000 tons more cargo space on the long trans-Atlantic voyage. Of course, if it was a short voyage, you could not get as much of a saving in cargo space, because the oil you have to carry gets very much less on the long voyage. But the ratio would be substantially the same; the horse-power consumption would be a third or a fourth less, whether in a long voyage or a short voyage.

### Motorships Profitable on Short Voyages

*Mr. Edmonds:* I think the general idea the Shipping Board had that the short voyages were not economical has been pretty well exploded?

*Mr. Briggs:* That is the Shipping Board's conclusion?

*Mr. Edmonds:* I think that has been pretty well exploded.

*Mr. Briggs:* The statement was made by Mr. Sheedy himself on the experience of the Shipping Board.

*Mr. Edmonds:* Personally, I cannot see any reason why, if it is economical on the one, it is not economical on the other.

*Mr. Lockwood:* We all have a good deal of respect for the Standard Oil operations for efficiency, etc. Last year, or the first of this year, the Standard Oil gave us an order for a small tanker to be used on the Hudson River, up through the canals, Diesel engine driven. I think Mr. Pew's company got the contract for the hull and we got the contract for the engines. That boat had not been in operation, I think, more than three months, before they gave us a contract for 16 more engines, and the Standard of New Jersey, a sister company, comes along and gives us an order for a tanker in the same way, so that our engines will be found in this bunch of ships you see here, some in the coast to coast, some on short voyages, some on long, and the saving seems to be uniform all the way through. Of course, the cargo saving is greater in long voyages. We feel like the dog that had his tail run over by the train and he looked around and said, "It won't be long now." The Diesel is coming and it is coming strong and we are all going to be very busy.

*The Chairman:* Is there any one else who desired to be heard?

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## SECOND DAY OF HEARINGS

### Further Statement of Admiral W. S. Benson, Member, Assisted by John Nicholson, Counsel, United States Shipping Board.

*Admiral Benson:* Now do you wish to have me take up the proposed amendment as just revised?

*The Chairman:* Yes.

*Admiral Benson:* I will read them.

[For this Amendment see page 87 February Motorship.—*Editor.*]

*Mr. Briggs:* I should like to have the Admiral enumerate the changes made in the existing law by the proposed amendments at this time, Mr. Chairman. I presume Mr. Nicholson can probably tell us about that, as he is counsel for the board?

### Changes Incorporated in the Foregoing Amendment.

*Mr. Nicholson:* First, instead of amending section 11 with respect to segregating a part of that construction loan fund to the use of putting in Diesel engines in vessels owned by the United States, we propose an amendment to section 12, which is the section dealing with the power of the board with respect to reconditioning vessels of the United States. Section 11, you will recognize, has in view aids to private persons and not at all to the powers of the board with respect to its own vessels, and we think it wise to keep that line of division. This joint resolution proposed something with respect to section 11, and what we are doing to attain the end aimed at by the joint resolution through an amendment to section 12.

*Mr. Larsen:* You have not made any change in section 11?

*Mr. Nicholson:* Oh, yes. We propose to amend section 11 by extending the benefit of the construction-loan fund not only to aid in the construction of new vessels, but to aid persons, citizens of the United States, in the reconditioning of vessels already in existence, with special reference to the installation of new machinery and commercial appliances of the most efficient and most economical type and kind. That is the main change in section 11. The changes of phraseology have to do really only with bringing about those two main changes. For instance, as at present worded, section 11 commences as follows, and we use the same language in the opening lines:

> That during a period of five years from the enactment of this act, the board may annually set aside out of the revenues from sales and operations, a sum not exceeding $25,000,000 to be known as its construction loan fund.

Up to that point there is no change. But in order to introduce an alternative power in the board, applicable in the discretion of the board, either to aid in the construction of new vessels or to aid in the equipment of vessels already built, by the installation of machinery and commercial appliances of a modern and efficient type and kind, the phraseology of the old section is necessarily abandoned and that is the only point we had in mind in changing the phraseology. It is not at all to change the form or the power. As we have changed it, it will read:

> The board may use such funds to such extent as it deems necessary and proper for making loans to aid persons, citizens of the United States: (a) In the construction by them, in private shipyards of the United States, of vessels of the best and most efficient type for the establishment or continuance of service on lines.

Now we have substituted for the word "maintenance" which appears in the original act the word "continuance." That change is made necessary for this reason: As it now is, it says for the "establishment and maintenance." That is subject to the construction that a loan could be made only for the building of a vessel to be put on a line yet to be established.

### How About "Motor-steamers" With Still-Type Combination Engines?

*Mr. Nicholson:* We have stated the reason. Then we have omitted the word "steamship" before the word "lines," for the obvious reason that a line on which is operated vessels containing Diesel engines is not a steamship line, because they are not steamships. They are known as motorships and, in the interest of accuracy of language, we do not say "steamship" lines, but simply say "lines," without qualification in that respect. That, I take it, needs no particular argument to sustain the propriety of the change. It is a fact, is it not, Admiral Benson, that vessels which have in them Diesel engines are known as motorships—they are not steamships?

*Admiral Benson:* Yes, sir. All motorships are ships, but they are not steamships.

*Mr. Davis:* It occurs to me that perhaps you ought to go further. We would not want to sell these ships at $5 a ton, plus the cost of reconditioning, or to sell them and then loan the funds for reconditioning them, and have those vessels soon to pass under foreign flags.

*Admiral Benson:* I get your point and I think it ought to be safeguarded in the act itself.

*Mr. Davis:* I would not take the position that they should be forever forbidden transferring to British registry; but, say, within a period of five years, or seven years, or some such period.

*Admiral Benson:* We do make a number of provisions in our bill of sale; for instance, that the ship must be operated on a certain route. Take the William Penn, which we had under discussion yesterday: Under no circumstances would the board be willing to sell the William Penn at any price if she was going to be run as a tramp, because she would break up all of our trade routes and ruin our whole business.

### Selling Cost After Commission

*Mr. Davis:* I assume that if this amendment should be adopted and the board author-

(*Continued on page* 285)

ized to recondition the ships with internal-combustion engines that it would not be the intention of the Shipping Board to turn around and sell those for less than the cost of reconditioning.

*Admiral Benson:* No; I do not think that would be contemplated for a moment, sir; it certainly is not in my mind.

*Mr. Davis:* It would be a wise provision to adopt an amendment to the effect, *"Provided,* That the ships so equipped by the Shipping Board shall not, within a period of three years therefrom, be sold for less than the cost of reconditioning, plus $5 per ton."

*Admiral Benson:* I think that would be all right for a limited time.

*Mr. Davis:* That is the reason I suggested three years. I readily agree that conditions might arise under which it would be desirable; but the point is this, just to let the shipping world and the prospective purchasers know that there is no prospect at any time soon of being able to get a lot of bargain-counter Diesel engine ships.

### The Most Modern, Most Economical, Etc.

*Mr. Briggs:* Now I do not notice in this act any condition of that kind. In here it says it should conform to certain things; "the vessel shall be equipped with the most modern, the most efficient, and the most economical machinery and commercial appliances." Who shall determine that — the builders themselves, the owners of the vesels, the prospective buyers, the Shipping Board, or whom? Is it to be in the judgment of the Board that is the case, or what?

*Mr. Nicholson:* You overlooked the fact, Mr. Briggs, that this language occurs in connection with the proposed application to the Shipping Board for the Board in its discretion, to make a loan for the purpose mentioned. Obviously, therefore, it is for the Shipping Board to determine whether the proposed use to which the money is going to be put appeals to its discretion and satisfies, in its judgment the requirements of the shipping act.

### He Has the Right Idea!

*Mr. Briggs:* You say "obviously." I do not know that that is correct, according to my construction of these things. I have found in my experience that a good many people understand certain things about acts, but when they are written in statutes in a certain form we find it is not so. And I do not know of any provision in here that the Board has to pass on whether it is economical or not. The board agrees to lend certain money for this purpose—

*Mr. Nicholson:* The board will not agree unless in its judgment the purposes here are met.

*Mr. Briggs:* You mean not only the actual declared purpose, but the actual construction and work? Suppose as the reconditioning goes along that the construction is such that the board could not approve that sort of conversion; what is the board going to do after it has made an agreement to lend the money?

*Mr. Nicholson:* The board would promptly stop advancing money if the borrower was not complying with the terms of his contract, sir. The very first requirement of the contract is that the applicant shall himself create and have a substantial equity, by himself putting in a large amount of money, before the board will advance him one cent.

### Cash Payment Question

*Mr. Davis:* There has been more or less criticism. I know Mr. Lasker, some time ago, announced that they were not going to sell ships on less than 50 per cent cash payment. I know there was a great deal of criticism from people who had in mind to try to buy a ship, but could not pay that much. Nobody except a strongly financed corporation could buy many ships, having to pay that much down. In other words, we have these different trade routes operating out of the different ports, and I can conceive why local people would get together a company that could buy them and be willing to buy them at long time on annual payments; but they would not be willing to go into it and could not go into it if it involved a cash payment, or half cash and the balance in a year or two. So it is a proposition that works both ways.

*Mr. Wertz:* May I say I believe the Shipping Board and Admiral Benson believe themselves competent to handle this situation satisfactorily to the great majority of the people of this country and they can perhaps best handle it by being not too much restricted in the details. They could do it better if we did not attempt to define every condition involved in it, because there are conditions that can not be foreseen, innumerable conditions.

### Loans to Date

*Mr. Briggs:* Undoubtedly that power thus far has not been abused by the board if only $400,000 out of the $75,000,000 has been loaned.

*Mr. Nicholson:* Then we come to section 12 of the merchant marine act of 1920, by which we achieve the power to use the money to put Diesel engines in vessels owned by the Shipping Board, and our provision here is an entirely new paragraph to be added to section 12. We make no changes in the present act except by adding this entirely new paragraph; hence you do not have to make any comparison of phraseology in the first part of that section. The new paragraph is as follows:

> The term "reconditioned" as used in this section includes the substitution of internal-combustion engines as the main propulsive power of vessels.

Section 12, as at present printed, reads:

> That all vessels may be reconditioned and kept in suitable repair—

And so forth.

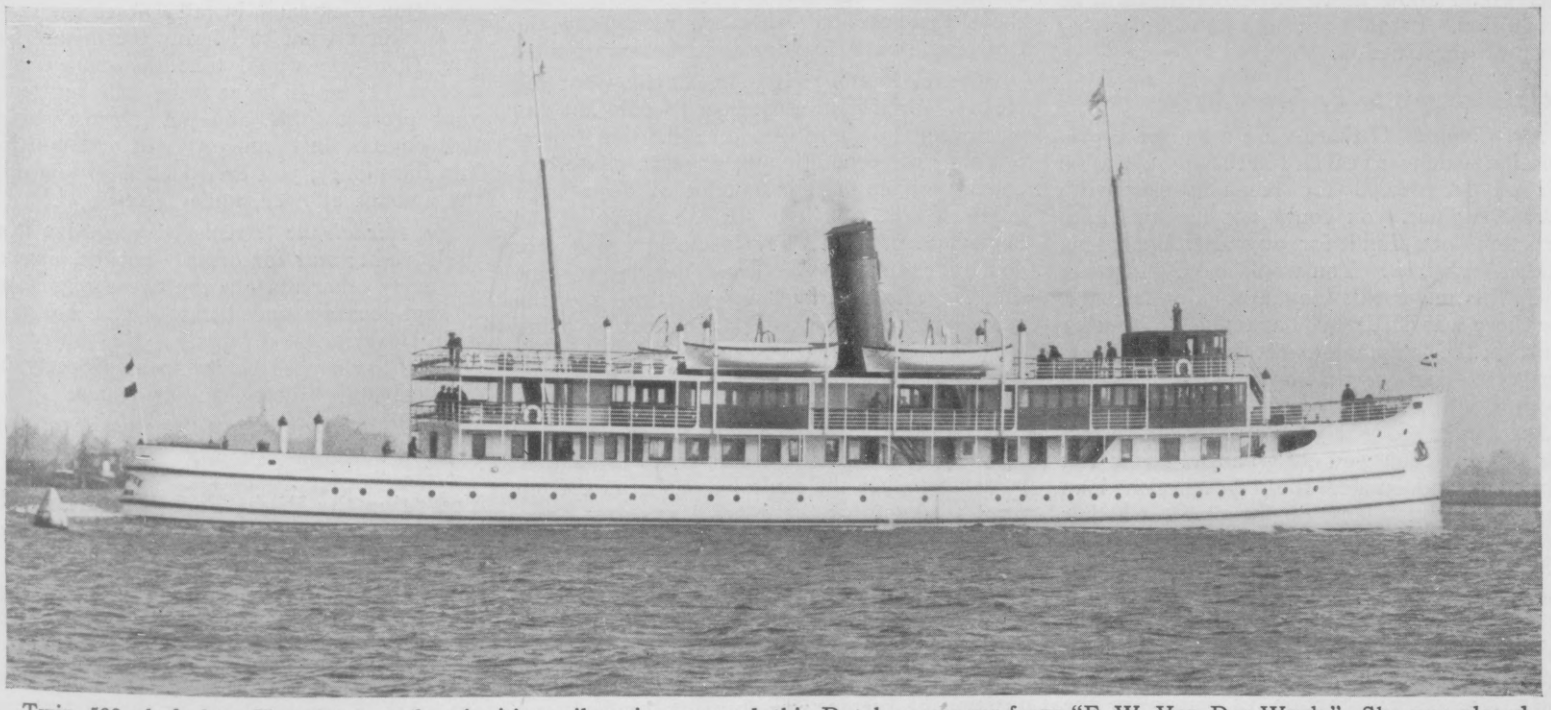
Now we define "reconditioned" as including the power to install entirely new propulsive machinery of this internal-combustion type. We really include that as a mere precaution and to eliminate all debate on the subject. Personally, I think the power exists now, without giving this definition.

### Limited to American Manufacturers

*Mr. McKeown:* Is there anything there that will prevent discrimination against any American manufacturers of Diesel motors? In other words, is there anything ——

*Mr. Nicholson:* On the contrary, sir, the way we have written this amendment, it would be limited to American manufacturers.

*Mr. Bland:* It would not effect discrimination by reason of particular contracts of builders with the owners of the Diesel patents?



Twin 500 shaft h.p. Kromhout surface-ignition oil-engines propel this Dutch passenger-ferry "F. W. Van Der Wyck." She was placed in service last fall, and represents a fine type of vessel that could be copied here

*Mr. Nicholson:* We have carefully used exceedingly broad language here; we have not used the word "Diesel," and we omitted using that word advisedly.

*Mr. Briggs:* "Internal-combustion engines" is the expression you use?

*Mr. Nicholson:* Yes; as being the most comprehensive term possible, is it not, Admiral?

*Admiral Benson:* Yes.

### How Foreign Builders Will Receive Consideration

*Mr. Bland:* Suppose a foreign make of the Diesel engine or the internal-combustion engine should be superior, in the development of the art, to the American; then what would you say to that?

*Admiral Benson:* Why, of course! There is a tax of 50 per cent, I think, which would be on the engine if it were introduced.

[The present tax is 40 per cent.—*Editor.*]

*Mr. Bland:* But is there anything to prohibit the use of the foreign-made engine?

*Admiral Benson:* Except it says "built in the United States in private shipyards." What I should do in that case, just as I spoke of the North British engine yesterday, there is a firm in this country that is trying to get the rights to develop it. If the company gets the rights to develop it, I would certainly give them every possible opportunity to develop it, because all of these are foreign—Burmeister & Wain, Doxford; they are all foreign.

*Mr. Nicholson:* It is true, is it not, in this act they would actually have to do the construction work of building the engines here in America, even under foreign patents?

*Admiral Benson:* Absolutely.

*Mr. Bland:* That is the idea and though the patent was a foreign patent, if the construction work was done in America, it would meet the requirements of that provision?

*Admiral Benson:* Exactly. In other words, I might say the board has taken every possible means to have every bit of labor and everything they can done in this country. Now, there is one thought that has just occurred to me in connection with this: My belief is that the ultimate in the development of motive power in ships is going to be a Diesel generator and electric drive. Now I should interpret it, if it were left to me, as drawn, that this would allow us to go into that form of propulsion. I would not hesitate to go to that form of construction.

### Total Amount to Be Spent by the Board

*Mr. Briggs:* If there were a budget appropriation which was carried in the appropriation bill of $20,000,000 for reconditioning with Diesel engines, you could not use this construction loan fund for any additional sum.

*Mr. Nicholson:* You would have the power to do this under this language. For instance, say there was $10,000,000 available from other sources; the language as set forth would permit you to draw on the construction loan fund up to $25,000,000.

*Mr. Davis:* Under your amendment to section 11, why could you not go ahead under that provision and, under the construction loan fund, recondition any of the ships, whether they were in operation or not?

*Mr. Nicholson:* Because section 11, sir, is intended to operate as a benefit to private owners.

*Mr. Davis:* And you propose to amend section 11 so as specifically to authorize——

*Mr. Nicholson:* Section 12 empowers the board to recondition vessels and that power, in the judgment of its counsel, exists to substitute Diesel engines for existing engines in the old hulls. The question is, though, if it has not the money with which to do it, how can it do it? We then amend section 12 by saying, of its own money, from its usual sources, that it may draw and transfer from this fund an amount not exceeding $25,000,000 to be applied to this special use of installing Diesel engines in its own vessels.

### Section Eleven Before and After Amending

*Admiral Benson:* I think I can clear up that point, if I may. The only changes we want to make in section 11 is to permit us to apply this construction loan fund to the installation of internal-combustion engines. As the law exists today, it only allows us to use it for the construction or for the building of new ships. And all we want to do is to extend the same power to the board to utilize the construction fund for the installation of internal-explosive engines and the necessary equipment. That is the only change we ask. On private ships; section 11 has nothing to do with Government ships.

*Mr. Edmonds:* In this section 12 you are endeavoring to extend the power for the use of $25,000,000 of this fund, together with whatever other funds you have, for reconditioning — for the Government to change over its own ships?

*Admiral Benson:* Section 12 has to do with Government-owned ships; section 11 has to do only with privately owned ships, and we request in each case an extension of power in order to encourage the installation of internal-combustion engines. In section 11 we apply it to them; in section 12 we apply it, to an extent not exceeding $25,000,000, to Government-owned ships. I think that is the basis?

### Board's Share of the Conversions is 50 Ships

*Mr. Davis:* Now, Admiral, I understood you to say you had made a survey and had in mind fifty Shipping Board vessels in which you desire to install internal-combustion equipment?

*Admiral Benson:* Yes, sir.

*Mr. Davis:* Do not make a distinction between those ships that are being operated and those that are not, that are owned by the Shipping Board, in your construction of this?

*Admiral Benson:* No, sir. Is this what you mean — for instance, the board would not feel warranted in going into an extensive system or policy of reconditioning or putting internal-combustion engines into a lot of these ships unless it could do it to the advantage of the immediate present. For instance, I will give you an example: We have five large ships that have geared turbines in them and the gears are worn out and my effort is being made to get the board to take those five ships and convert them into motorships and then to place them on certain lines, such as to the Far East, but this is all done with a direct bearing on present conditions. Also, there is another point, to reduce the capital cost, because from what we know of the general shipping situation we feel sure that if we could do that there would be private purchasers for these ships at once and it would be a great impetus to the shipping world and the advancement of the interests of our own people to have it.

*Mr. Edmonds:* Section 12 takes up the question of keeping the ships of the Shipping Board in shape?

*Admiral Benson:* Also, to recondition ships, like the Congressman stated.

*Mr. Roach:* But it did not provide the money.

*Mr. Briggs:* It transfers part of the construction loan fund to the Shipping Board for that purpose.

### Transferring Part Loan Fund to Section Twelve

*Mr. Edmonds:* This does, but it did not before. Now what happens here is this: You extend section 11 and say if a man owns a ship today and he wants to put an internal-combustion engine in, you can loan him the money on a mortgage on account of the internal-combustion installation——

*Mr. Nicholson:* Correct.

*Mr. Edmonds:* Up to 60 per cent, or whatever the figure is. In other words, after he gets the engine in and says the boat is worth $60 a ton, you can loan up to two-thirds of the full cost of putting the internal-combustion engine in?

*Mr. Nicholson:* Exactly.

*Mr. Edmonds:* Now, you have your outside ships taken care of and that is section 11?

*Mr. Nicholson:* Exactly.

### What Every Shipowner Should Know

*Mr. Edmonds:* Then if a man should come to you and say "If you will take these ships and put internal-combustion engines in them I will buy them of you," you then do it under section 12?

*Mr. Nicholson:* Exactly.

*Mr. Edmonds:* You take the money out of the $25,000,000 and recondition the ships and sell him the ships, taking a mortgage, not under this but under the ordinary provision as to ships that are sold, and it has nothing to do with section 11?

*Mr. Nicholson:* Exactly.

*Mr. Edmonds:* So that if a man came into you and said he would make an agreement with you, if you would put internal-combustion engines in 10 ships, to buy those ships off of you, you would have to do that under section 12?

*Mr. Nicholson:* Entirely correct.

*Mr. Edmonds:* But if the man comes to you and says I have some ships and I want to recondition them and install Diesel engines in them, and I want to borrow the money from you, then you would take the money under section 11; or if he says he will buy ten of your present ships, and put internal-combustion engines in them, provided you will loan him the money, you then loan it to him up to the amount allowed, under section 11?

*Mr. Nicholson:* Precisely; you have it entirely right; and for orderly bookkeeping and for many other reasons the two things should be kept separate and distinct. One has to do with Government property; the other has nothing to do with Government property, but with private property, and is a loan.

*Mr. Bland:* It is just for Diesel construction.

### You're on the Right Tack, Mr. Edmonds!

*Mr. Edmonds:* If we are passing a bill for installing internal-combustion engines, that is all right; but if it is to meet accrued obligations of some other kind, I want to know what they are before we run into them.

*Mr. Roach:* May I ask if you have found out what is contemplated in the Budget now pending before the Appropriations Committee?

*Mr. Nicholson:* The amount appropriated last was $50,000,000.

*Mr. Roach:* You do not know now what is contemplated for this year?

*Mr. Nicholson:* I do not know what is contemplated for this year in the pending Budget; no, sir. The fiscal year now current, 1924.

*Mr. Davis:* Now, Mr. Nicholson, this $50,000,000 for the present fiscal year—in other words, the one expiring next June—was simply a $50,000,000 lump-sum appropriation, was it not?

*Mr. Nicholson:* That is my understanding; yes, sir.

*Mr. Davis:* Is that the way you remember it, Mr. Edmonds?

*Mr. Edmonds:* Yes; and then there was some money provided for the payment of claims. The $50,000,000 was intended to cover losses of the Shipping Board for this year. I am told that your request for appropriation to cover losses on operation for next year is $30,000,000?

*Mr. Briggs:* Then they have added some $15,000,000 or $20,000,000 for the rehabilitation of ships?

### The Board Can Spend $18,000,000 Without the Amendment

*Mr. Davis:* The fact is the expenses or losses of the Shipping Board last year were only about $32,000,000—now the remaining $18,000,000—was that turned back into the Treasury, or was it used for some other purpose?

*Admiral Benson:* No disposition would be made of that until the end of the fiscal year. You might use some of it for this very purpose.

*Mr. Briggs:* Have you the prices at which the tonnage sold in the last year—this hundred ships or more—the average price per deadweight ton?

*Admiral Benson:* Cargo ships brought about $30 a dead-weight ton; tankers $45 (some one or two), some as high as $50, and some $47.50. For instance, a tanker we sell on this coast, inactive, at $45 a ton, due to the fact that if the tanker was on the west coast, ready to fill with oil, we would increase the price out there $2.50 a ton, making it $47.50, because the tanker would be right there and they would be under no expense of taking it around; and, in order to equalize, what we have determined to do in the sale of our ships, was to make the terms such that no purchaser would have an advantage over any other purchaser. For instance, when we sell these ships for Dieselization, as I said yesterday, we stipulate that the ship shall not be used in the coastwise trade or overseas until the conversion has been made; otherwise we would give them an advantage. In the same way, with the sale of all of our ships, we try very carefully to eliminate any possibility of handicapping any other purchaser.

### Cost of Conversions

We felt that selling the ordinary ship at from $5 to $10 a ton it would cost the purchaser, as has been stated here, from $40 to $60 a deadweight ton to properly equip it with the internal-combustion engines, giving them a capital cost finally on their ship of, say, anywhere from $50 to $70 a deadweight ton. Now, to get a similar ship similarly equipped in a foreign yard it would cost the foreigner about $80 a deadweight ton, which would give the American owner, after he had gotten his ship equipped and ready for service, a capital advantage of about $10 a dead-weight ton over his foreign competitor which would help him materially in carrying on his operations and competing with the foreign shipping people. That was the idea.

*Mr. Briggs:* There were expressions here yesterday from certain witnesses before this committee that they were constructing these Diesel ships in England for from 10 to 15 pounds per deadweight ton, which would really be less than the estimate you made, would it not?

*Admiral Benson:* Yes. And I do not know who the witness was, but that does not bear out the information of the board. I think we have some people in this country, builders, who, if they were in a pinch and particularly if they could get eight or ten of these ships, might equip them with certain types of Diesel engines for a little over $40 a deadweight ton, which would still give them a handicap over the British at 10 or 15 pounds.

*Mr. Briggs:* In other words, it would give the Americans an opportunity to compete on practically equal terms with their competitors in other countries with the merchant marine and to have a tendency to insure the perpetuation of the American flag on the seas?

*Admiral Benson:* Yes: and I have worked for an advantage. I will state I am responsible for this policy; I have gone in and asked the board and they have approved the policy. My idea was not only to equalize it, but to give them an advantage of anywhere from $5 to $10 a deadweight ton. I think it is one of the very best ways for the Government to help the American merchant marine.

### Present Conditions of Board's Ships

*Mr. Briggs:* You have had, recently, a survey made of the ships of the Shipping Board, have you not?

*Admiral Benson:* The reason for the survey was we felt, as a business proposition, that we should have in the hands of the board and on record, as nearly as we possibly could, the exact condition of every ship that we had; not only the condition that it was in, but what it would need to put it into operating condition and about what it would cost. We thought that was something we ought to have as a matter of efficient business precaution. The statement had been made that the ships had deteriorated. I have visited a good many of these ships myself; I have gone out in a boat alongside of them with a scraper and I have examined the bottoms, where reports were made they were deteriorating very rapidly, and I have found that was not so. I found some of them, for instance the bunch in the James River which has been there for several years, with the exception of a little mud and slime that has collected on them, they are practically in about as good condition as could possibly be expected. It was said the paint was coming off and the bottoms were being eaten up and they ought to be drydocked and repainted. To drydock and repaint the bottoms of this fleet would cost millions of dollars.

So I, with one or two other members of the board, went down there and went out in a little boat and went all through the fleet and I used a scraper and examined personally the bottoms of those ships and they really are in excellent condition. In regard to the decks and machinery, there were cases where ships that had been in service and were then laid up that the ashes had been left on the ships, water in the tanks, and so on, which was pardonable, and in some cases the cylinder heads had not been taken off and the engines properly lubricated; but, as a rule, and taking all things into consideration, the fleet was found to be in fairly good condition.

### Are in Good Shape for Conversion

*Mr. Briggs:* And in the proposed conversion by the Shipping Board of these vessels to Diesel type, to the extent indicated, you think the Shipping Board vessels are fully worth while to justify such conversion?

*Admiral Benson:* Absolutely. And those that we have recommended, we have had particular reference to what changes and what improvements we could make and we have had all of this data gone over and we have selected men with the greatest care to make a personal investigation of the ships and machinery, got their detailed reports, and then we had a board of experts take that data and put it into proper shape and give us an estimate of the probable cost of putting them into condition. So that if a purchaser comes now into the Ship Sales Division and says "I want to buy a certain ship," mentioning a certain ship, and wants to know what her condition is, we have the data right there and can open the books and say that "that ship is lying in the James River; she is in such and such condition; she needs new pumps or has a cylinder cracked, or her tail shaft needs leveling, or something of that kind, and, to do that, we have estimated it will cost so many thousands of dollars." Now there is all the data before the purchaser. If he wants to take her at that, why we usually sell our ships, because we had so much trouble in the beginning, "as is and where is," with the privilege of docking the ship at his own expense and, if on docking the ship injuries were discovered that would be covered by insurance, that we would make that deduction in price.

### Got $18,000,000 and Want Another $7,000,000

*Mr. Roach:* I would like to get cleared up on the appropriation of last year and next year. As I understand, you say you have lost $32,000,000? Now, do I understand that the balance of $18,000,000 is available—unspent? Why would you need to come before us for an appropriation of $25,000,000 if that is available?

*Admiral Benson:* We are not, sir. What we are asking you for is if we have $18,000,000, we want to have the privilege of transferring $7,000,000 from our construction loan fund for this purpose, as we see fit.

*Mr. Roach:* If there is $15,000,000 or $20,000,000 more in the next appropriation, would you still think that is necessary?

*Admiral Benson:* That is why I asked you to limit us. As I suggested yesterday, I asked and urged the committee not to permit us to go beyond $25,000,000 for this purpose at this time. I think it is ample and I do not think it is advisable to grant us authority to go beyond that until we experiment a little and work a little.

*Mr. Nicholson:* It was not only so written, but when I was explaining it I stated distinctly it would have that effect; it would be $25,000,000 in addition to any moneys from other sources. But it is easy enough to rephrase that so that the maximum amount which may be used will be $25,000,000.

### How Much Did the Board Lose?

*Mr. Davis:* Now, with respect to the sum of $32,000,000, which was mentioned as being the loss of the Shipping Board: As a matter of fact, there was not any loss of $32,000,000,

but only about three or four million dollars lost—is not that the fact—and the balance of it went to pay the various expenses of the board?

*Admiral Benson:* That is the whole business, overhead and everything.

*Mr. Davis:* Personnel and employees and everything?

*Admiral Benson:* Everything, as I understand it.

*Mr. Davis:* And the voyage loss was only some three or four million dollars?

*Admiral Benson:* Yes, sir.

*Mr. Davis:* In order that we may thoroughly get together on a common interpretation, I want to ask you this: Under subsection b, of section 11, as proposed, the Shipping Board could sell any one or more of the Shipping Board vessels and then, out of the $125,000,000 loan fund loan the owners of those vessels money for Dieselizing those boats?

*Admiral Benson:* Exactly so, sir; that is the idea; that is what we want to do; that is it exactly. It does not make any difference whether he owns a ship already, or whether the time of the Dieselization?

*Mr. Davis:* That was my interpretation, but one of you gentlemen a while ago, as I understood you, said that section 11 had no reference to Shipping Board vessels. I suppose what you meant was those still owned at the time of the Dieselization?

*Admiral Benson:* Exactly. I see the distinction; yes, sir.

### Great Britain's Motorship Loan Fund

*Mr. Davis:* And I asked you what loan had been made except one of $10,000,000 to the Cunard Line. Since what transpired, some gentleman has handed me an extract, apparently from some magazine (MOTORSHIP), in which it is stated that recently Great Britain had loaned $10,000,000 to go toward the construction of some Diesel ships and had guaranteed a loan of $8,000,000 to go toward the construction of nineteen motorships. I think it is very proper to state that.

*Admiral Benson:* But, as I stated, while I am not in a position and have no data at hand, I am quite sure that careful investigation will show very much larger sums and a larger number of them than that.

*Mr. Briggs:* The Shipping Board is now having to operate to a certain extent, even with these vessels which might not be taken immediately off the board's hands by private parties?

*Admiral Benson:* We could operate them to very much better advantage than operating the steamships we have now, so that you are taking no chances except the chance of very materially building up and helping.

*Mr. Briggs:* That is the impression I wanted.

### Will Save Our Merchant Marine

*Admiral Benson:* Another thing, the fact that you would give us the privilege of spending this $25,000,000 for this purpose would be one of the strongest arguments to our foreign competitors that we are in this business to stay, and not only to stay but we are going to keep up to the very highest possible standard, that we are going to keep pace with the developments of the day and we are in this business to stay; and you will find immediately it will have a remarkable effect on the whole shipping situation.

*Mr. Briggs:* Bettering the shipping situation?

*Admiral Benson:* Yes, sir; bettering the shipping situation, absolutely.

*Mr. Edmonds:* If foreigners know you are going to turn enough tonnage right over to motorships to make it a very serious question whether their advertising campaigns which they are putting out are going to be successful, if you get in ahead of them with the ships, you will capture the trade. That is the whole situation in a nutshell.

You have $75,000,000 lying idle and if you take $25,000,000 and put it in absolutely efficient boats it will better the whole situation. It is the easiest thing in the world if we will only stop squabbling, to take those ships we have and put them into shape and show England, Norway, Sweden and Holland that we are not only going to compete, but are going to go ahead of them; and if this is the last word and we bring our ships up to date we are bound to be ahead in a year.

### A Total of $125,000,000 for Dieselization

*Mr. Davis:* In connection with the proposed restriction the Admiral himself said he thought it ought to be made to confine this encouragement and this improvement to the $25,000,000. If this should be adopted, section 11 as amended would authorize you to lend any portion of what is now $75,000,000 and in the course of two more years will become $125,000,000 for Dieselizing ships, or making loans for that purpose and then, in addition to that the amended section 12 authorizes you to Dieselize our own ships up to the extent of $25,000,000.

*Mr. Edmonds:* Surely you do not object to that, Mr. Davis, do you? I do not. Personally I will say this to you that if we lend private business and individuals that money, and I had the ships I felt were perfectly good to put these engines on, I would Dieselize one hundred or one hundred and fifty out of that money instead of fifty.

*Mr. Briggs:* I understand the provision here is intended not to give the Shipping Board $25,000,000 in addition to the $125,000,000, but to take $25,000,000 out of that fund so that in the end we will have no more than the maximum amount now authorized by law in the construction loan fund.

*Mr. Davis:* That is true, but the point is there will be $125,000,000 available for Dieselization.

*Mr. Edmonds:* I venture to state this will bring one hundred Diesel boats in our merchant marine inside of two years.

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## CURRENT TECHNICAL REVIEWS

### A New Oil Text Book

Two quarto volumes aggregating more than two inches in thickness and devoted to the comprehensive subject of Diesel and Semi-Diesel engines have been written by G. Vaillot and published in Paris by Dunod. Contained in the first of the two volumes is an interesting historical chapter well-illustrated by photographs of those Diesel engines whose successive appearances marked the various stages in the development of the art. Types which have been illustrated in the literature again and again are thus reproduced. But the pictures appear in their historical order and as they are dated and briefly described they become fixed in the reader's mind in the places where they belong.

Chapters which presuppose a thorough general knowledge of engineering are those dealing with thermodynamics and a theoretical study of the Diesel engine. These are of considerable extent, including, as they do, complete comparisons of the various cycles and a treatise on the variation of specific heats. For a well-trained general engineer about to take up Diesel engine work these chapters would be of value.

Practical matters, however, are not overlooked. Considerable sections are devoted solely to the subject of air-starting, while others treat of reversing mechanisms. Descriptions of currently manufactured types are illustrated with such a wealth of drawings, sections, details, and halftones that they cover the major portions of the first volume and there are among them reproductions of makes not widely known.

The second volume is devoted to marine installations and accessories, both of which subjects are treated in minute detail. The derivatives of the Diesel are taken up one by one and are made available for study by the aid of abundant sectional drawings and illustrations.

It would be difficult to mention a single item of engineering too remotely associated with oil engines to be treated in "Diesel and Semi-Diesel Engines." The French in which it is written is of a readable style and is made readily understandable even to those having only a limited command of this language because the profuseness and clearness of the illustrations. Copies can be obtained from the office of MOTORSHIP, 27 Pearl St., New York. Price $9 for the two volumes plus postage.